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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[GENERAL ANNOUNCEMENT.]

THIRTY-FIRST ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

AMERICAN GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY,
58 WILLIAM STREET, N. Y. CITY,
September 16, 1903.

There will be an annual meeting of the American Gas Light Association held at Detroit, Mich., October 21st to 23d, 1903.

The meeting will be called to order by the President, Alten S. Miller, of Baltimore, Md., at 10 A.M., Wednesday, October 21st.

The Meeting Hall will be announced later.

The headquarters will be in the Russell House, Detroit, Mich.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may be averted.

The Russell House is conducted on both the American and European plans, and the rates for rooms will be as follows:

American Plan: Rooms without bath, $3 per day for each person; rooms with bath, $4 per day for one person, or $7 per day for two persons ($3.50 per day for each person) and upward. European Plan: Rooms without bath $1.50 per day for each person; rooms with bath, $2.50 per day for each person, and upward.

Another hotel is the Cadillac, which is not far from the Russell House, and the rates of which are about 50 cents per day higher than those quoted by the Russell House.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will, at the door, receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the hands of the Secretary by October 11th, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"Our Correspondence School," by Mr. Alex. C. Humphreys, New York City.

"The Advantages of Enrichment," by Mr. Arthur G. Glasgow, London, England.

"Municipal Ownership," by Mr. H. L. Doherty, New York City.

Other papers are promised, but the authors have not yet decided upon the exact titles, so the announcement of them will be deferred.

If the papers are of a sufficiently high standard, the Beal medal will be awarded to the author of the best paper presented, the question of which is best to be decided by the proper committee.

A lecture will be delivered to the Association.

During the days of the meeting all the announcements will be posted on the bulletin boards at the headquarters and meeting hall. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work, by affording a ready means of recognition.

In order that the year book containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given that, if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving Detroit, but not after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned in to the printer immediately after the adjournment of the meeting.

Special.—The entertainment will include a smoker Wednesday even-

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SMITHSONIAN DEPOSIT.

ing, a banquet on Thursday evening, and a steamboat excursion on Friday. The boat will stop at various points of interest. For the ladies there will be a theater party on Wednesday evening, and the banquet and excursion as above. The price of tickets for each person will be $5. It will be necessary for members to procure a ticket for each lady accompanying them. Please fill out and mail to the Secretary at once the inclosed postal card, so that the Committee of Arrangements may know how many are to be taken care of. A. E. FORSTALL, Sec.

BRIEFLY TOLD.

THE WORLD'S FAIR CIRCULAR.—In this issue we print in full the circular letter, prepared by Mr. Frederick H. Shelton, President of the Western Gas Association, respecting the plans underway for the proper representation of the gas industry at the coming World's Fair, to be held in St. Louis next year. The initial steps were taken by Mr. Shelton, through vote of the Association at its meeting last May, and from the actual enthusiasm with which this circular's revealments have been received, there can be no doubt that the Western's scheme will be in every sense a success. Whatever funds are necessary to carry the project through we make bold to say could be raised in a fortnight by subscription. Read the circular carefully. It will be found on pp. 522-23. One very influential gas man in the Southwest, writing to us on this matter, among other things, said: "I do not know whose idea it is to put a miniature of the Southwest Pass Lighthouse in the Western's exhibit at the World's Fair in St. Louis, but it is certainly a splendid one."

NOTES—

A WORD or two regarding the virtual retirement from active business of Mr. F. H. Eichbaum, who for 21 years acted with success and discretion as the Superintendent and Engineer of the Pacific Gas Improvement Company, San Francisco, will certainly not be out of place. The plant of the Company had become too small for the output demands that were being made upon it, and that it might be put in shape to meet those demands required practically its rebuilding. The task seemed too great for Mr. Eichbaum's energies (he is in his 78th year), and he determined to pass it on to a younger man, who has been selected in the person of Mr. F. Foveaux, who is fully equipped by education and training to prosecute the work successfully. Mr. Eichbaum is to act as consulting engineer to the Company, and all will join with us in wishing for him many years of usefulness in the lighter harness of the profession—a profession that he has served faithfully and successfully.

AT the request of the Editor of the *Gas World*, London, England, who writes under date of September 18th, we reprint the following editorial reference to the objections made by Dr. W. H. Birchmore over the summarized report in the *Gas World* of his lecture on "Naphthaline," delivered last May before the Western Gas Association—the Doctor's "objections" were printed in the JOURNAL for August 31st last:

"In our issue of the 25th July last we gave a condensed report of a lecture on naphthaline, delivered before the Western Gas Association of America, by Dr. W. H. Birchmore, of Brooklyn, N. Y. The original discourse was exceedingly prolix, and so full of undigested chemical theorizing, padded out with excerpts from the text books, that it was a work of no small difficulty to get at the pith and marrow of what the lecturer intended to teach, or to find out its bearing on the practical problems of gas manufacture. However, we flattered ourselves we had managed, at the cost of an infinity of trouble, to winnow out a little wholesome grain from an intolerable deal of chaff! In the issue of the AMERICAN GAS LIGHT JOURNAL for the 31st ult. [August], Dr. Birchmore denounces our summarized and intelligibly expressed version of his remarks, and takes us severely to task for having presumed to abstract his paper. What else could we do? To have printed the whole would have imposed too great a tax on the patience of our readers; to have neglected it altogether might have wounded the *amour propre* of the lecturer, besides appearing to ignore the technical labors of our Transatlantic cousins. The head and front of our offending seems to be that we have taken Dr. Birchmore's remarks too seriously, in supposing that his theorizing had any practical application for gas engineers, or his experiments any serviceable relation to actual working. But as his remarks were addressed to practical men, we naturally concluded that they aimed at giving helpful guidance for works practice, and not merely directions for performing questionably useful laboratory experiments. That we may not again fall into a similar error, should Dr. Birchmore again take to the rostrum, we would respectfully suggest that he should endeavor to express himself intelligibly, or, in common parlance, to say just what he means."

[OFFICIAL.]

Circular Letter Issued by President Frederick H. Shelton, Respecting the Initial Steps Taken by the Western Gas Association to Have the Gas Industry Properly Represented at the Louisiana Purchase Exposition.

WESTERN GAS ASSOCIATION,
OFFICE OF THE PRESIDENT, PHILADELPHIA, PA.,
September, 21, 1903.

To the members of the Western Gas Association: The St. Louis "World's Fair," or the Louisiana Purchase Exposition, to open May 1st next, is the greatest event of its kind undertaken in any country. Its exhibit floor space will be 10 times as much as at the Buffalo Exposition; twice as much as at the Chicago "World's Fair" of 1893, and 3 times that of the Paris Exposition of 1900. There will be 1,240 acres of ground inclosed; the various appropriations made exceed $24,000,000.

The question of participation in the St. Louis Fair by the Western Gas Association was discussed at the Indianapolis meeting, last May, and by vote was left in the hands of the President with power to act. As President for the year, I have given the matter much thought, and have sought the opinion and counsel of many representative members of the Association. I have so far found the uniform opinion (*a*) that the gas industry should certainly be represented if reasonably possible; (*b*) that the Western Gas Association, particularly centering in the Mississippi Valley, could and should, most appropriately, arrange for some kind of an exhibit; (*c*) that this Association could also most appropriately act as host to visiting gas men by providing suitable headquarters; but that (*d*) being, primarily, a body of gas engineers and managers, it should not undertake to make what is commonly known as a "trade exhibit," leaving that to the supply and trade interests proper, as they may see fit; and (*e*) should confine itself to an exhibit showing (1) the process and methods of gas manufacture and distribution; (2) the history of illuminating gas development in the United States; and (3) the utilization of gas in its many appliances and channels.

Strongly agreeing with the above, and with the matter left in my hands, I have gone ahead on such lines, and am glad to be able to state that there is every prospect of the Western Gas Association making such an exhibit as has never before been put together in any American Exposition, and having a convenient meeting place and such a welcome as should be for every visiting gas man, whether an Association member or not, or whether from the United States or abroad, and all of such a character and in such location as will be entirely creditable to the Association and to the industry.

Arrangements have substantially been made by which the Association will have suitable space in the very center of one of the principal buildings, namely, the Palace of Liberal Arts, 525 feet wide by 750 long, costing nearly $500,000. Formal application for the space has been filed, and it is understood that the Association will have it when the allotments are made. The matter herein is contingent upon the due securing of the space, of which, however, I believe there is no question. In this space it is proposed to illustrate the standard *processes* (not undemonstrated ones) of gas manufacture and distribution, by machinery (if small in size), or by models, parts, plates, photographs, samples of raw materials, residuals, mains, meters, joints, tools, testing apparatus, etc. Also to illustrate, as fully as may prove possible, *the early forms* of the same things, in contrast to standard types and practice, constituting an historical exhibit of the greatest interest. Also, to assemble the fullest possible collection of *appliances* for the use of gas, by having not only standard burners, heaters, ranges, and engines, but the special appliances used in many manufacturing and trade industries that serve to create the large day load of many places. Such exhibit should be of great educative value to the public and very helpful to the visiting gas man.

In addition, arrangements have been concluded whereby the Association will also occupy the very center circle itself of the Liberal Arts Building, and will have the honor and prestige of contributing the "central feature" for the building. It is proposed, as such centerpiece, that the Western Gas Association shall tender to the Exposition a model, of about one-third scale, of the Southwest Pass Lighthouse. This lighthouse, 125 feet high, is the beacon that greets the commerce entering the Mississippi Valley. It is the first structure visible in the land of the Louisiana Purchase Exposition, to the visitor, or to the returning traveler entering by the southern gateway. Geographically and sentimentally, it is appropriate and of interest, and as a light giving structure it well lends itself to the typifying of the prime purpose of our Gas Association. This lighthouse, well carried out in design and construc-

tion, and rising some 45 feet above the general floor level, and constantly shedding its silent beacon light (duly furnished by high candle power gas lamps in the lantern), will fittingly symbolize the Western Association's purpose and prominence.

In the space to be occupied, a registration desk for visitors, with chairs, divans, stationery and other conveniences, to constitute a convenient resting and meeting place, as well as information bureau, will be provided. It is believed this will be of great practical use to visiting gas men and their friends, and that many pleasant memories will cling to the already launched gas men's slogan for 1904, "Meet me at the lighthouse" in the Liberal Arts Building.

The above is the enterprise as now planned. Enough assurances are in hand to make it a success, but, of course, the more the Association members, as individuals, assist in getting exhibits, the greater will be the success. It is the idea that every member should lend what he can to constitute and create the exhibit—gas company men lending models, plates, photographs, parts, or old historical exhibits; and supply or trade members, models of their apparatus, or standard samples, etc., of the goods they make. *If you are a gas man, will you think what you can lend suitable for the above?* If, moreover, you know of something that a neighboring gas man has, such suggestion to me will be welcome. *If you are a supply man*, kindly bear in mind that the exhibit that the Association will put together is not intended to replace the usual trade exhibit of a full line of goods of various patterns, etc., occupying considerable space that a commercial exhibit would ordinarily involve.

Lack of space alone would prevent the Association from arranging for this; as already stated, regular trade exhibits will have to be provided by the trade interests proper. But the Association desires, will welcome and will appreciate from each trade interest a single sample of regular goods manufactured, as typical of gas machinery and appliances, if of moderate cubic size, or else models, photographs, etc., that will equally illustrate. Each exhibit will have a printed card stating what it is and give full credit to the gas company, firm, or individual loaning to the Association, but the classification and grouping and arrangement of all will be determined by me, together with the suitability of the exhibit, and the labels proposed. This power must be reserved by me, for the best interest of all concerned. My single purpose shall be to have a sample of every characteristic ware made and supplied to the gas trade, having every maker with some representation, and his name in evidence, and to arrange the exhibits so as to best show their gas value without preferences or prejudices, or the putting of anyone's exhibit either in the foreground or background. It is felt in this connection that there is yet good time in which to make any desired models.

Those who kindly lend the Association exhibits, as above, will be asked to stand the expense of freight and boxing. The Association (from funds as below) will supply the stands, showcases, platforms, railings, furniture, labels, printing, etc. It will also have a regular attendant engaged to watch over everything, and will insure the exhibits on the best possible terms, but beyond this cannot, naturally, assume responsibility. Exhibits must be in St. Louis in the spring time, at a day that will be later given, and they cannot be withdrawn until the close of the Fair, about December.

Finances.

The Western Gas Association, as its members, of course, know, has no funds available from its regular income for this unusual expense. Nor would it be proper to draw on its income to any extent for this purpose. It is necessary that the matter be practically a subscription affair. Fortunately, the cost will be moderate, and there is but little doubt that the necessary funds can be raised by comparatively moderate subscriptions from those willing to contribute to a reasonable extent to make a success of such an enterprise, to the credit of the Association and helpful to the gas industry. The space costs nothing; the fixtures, showcases, railings, attendant, insurance, stationery and preliminary and incidental items, and the lighthouse, foot up less than one would expect. Estimates are not yet completed, for it is obvious that until an approximate idea of the amount of exhibits is known, the amount of showcases, etc., cannot be determined. I cannot yet advise of the probable cost. There is nothing compulsory, however, in the matter, and there are no assessments, and pending further and more definite word to each member on the question of finances, I merely wish to ask at present, that, *assuming* this part will work out all right, will you kindly help me in going forward in the matter of filling in the inclosed blank and returning it at an early date, and by making a special effort to provide something worth exhibiting, and, further, by volunteering suggestions as to the exhibits, *or any other point* that will, in your opinion, improve the enterprise.

The exhibit should be the work of many of the members, and not a few only; the Association is in rare good fortune to secure such an excellent location as the center of one of the principal buildings, and without expense for space, and, in my opinion, it is an opportunity at a comparatively moderate cost to each of those participating to have an exhibit better than anything yet in its line in this country, that will be in every way worthy of the good old Western Gas Association.

I will send further information in a later circular, as such seems desirable, and in the meantime will be glad to answer inquiries on any points on which fuller details are desired.

Please note that the whole matter is over and above, and aside from the regular convention of the Western Association, to be held in St. Louis, May next.

Yours truly,

F. H. Shelton, President.

[Continued from Page 486.]

ELEVENTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

Held in San Francisco, Cal., July 21-23, 1903.

Second Day—Afternoon Session.

The paper by Professor G. A. Bobrick on

LIQUID AIR

was then read by the Secretary.

[For the text of Prof. Bobrick's paper, see Journal, Aug. 24, 1903, p. 282.]

Discussion.

Mr. Lowe—I think for the first time in the history of the gas business the Pacific Coast Gas Association is enabled to call the attention of the gas engineers of the world, through its published proceedings, to the advantages of liquid air for its use in connection with illuminating gas. It is absolutely new to the gas industry. Only little has been said, but the Pacific Coast Gas Association will have the honor of being the first to tell it to the world. That means a great deal to us, and it means a great deal of advertising for us on the Coast and elsewhere. To Prof. Bobrick we owe this advantage. We saw his light last night, and I think none of us will doubt it has passed the experimental stage; but I regard as being of equal, if not of greater importance, the use of cheap oxygen in connection with the construction of our gas works. Stop for a moment to consider the laying of street mains, especially with wrought iron pipe—and I think the world is coming to the use of wrought iron pipe. We have a joint about every 20 feet—we have heard the discussion with reference to the relative merits of the various joints. Suppose we weld the pipe in the trenches with our own gas assisted by a few cubic inches of cheap oxygen and secure a pipe with no joints, and how far we have gone towards reducing not alone our expenses of construction but also the chances of leakage. The same thing applies to other parts of our works. If we can weld seams instead of riveting them we can overcome one of the weak points of construction. I believe Prof. Bobrick is opening for us one of the most marvelous fields of usefulness upon whtch we have yet entered.

The Secretary—I would like to ask, for the purpose of bringing out a little discussion, a question regarding the danger of explosion. As I understand it, in the application of this liquid air or distilled oxygen to the lighting industry it is proposed to have two sets of pipe, one for conducting the gas to the burner and the other for conducting the air, bringing them together at the burner.

Prof. Bobrick—I have made some experiments with it. I mix my gases in a cylinder which has been tested to a pressure of 300 pounds to the square inch, carry the gas for a distance of 2,000 feet mixed, and ignite the gases at the burner already mixed. I find that I can use one pipe, but still I appreciate the fact that there is danger in making an explosive mixture, especially with large pipes. Of course, as I stated before, the industry is in its infancy, and it will require more than one mind to devise means to harness it completely. I should say that to-day we may require 2 pipes, one carrying the oxygen and another carrying the illuminating gas. Still it is possible that in time we shall be able to devise means of carrying the two gases in one pipe with perfect safety. When I first attempted to mix the illuminating gas with oxygen I took every precaution to prevent an explosion. My experience has been limited to 2,000 feet, but at that distance 4,000, candle power was operated successfully for hours without any danger.

I was asked whether the oxygen would not separate from the illuminating gas. You cannot separate them unless by liquefaction.

Mr. Britton—Assuming that you were operating a number of street lamps in a city with two lines of pipe, with the proportions of 8 parts of illuminating gas and 6 parts of oxygen, what would be the pressure in the pipe delivering the oxygen and what in the pipe delivering the gas?

Prof. Bobrick—Practically the same. Of course, it will depend upon your valve and orifice. The orifice I generally use is $\frac{1}{100}$-inch in diameter. If your gas was under a normal pressure of 4 inches of water, you could have 5 pounds pressure on the oxygen pipe. It would be simply a matter of economy in carrying the gases at high pressure. It would work just as well at a low pressure.

Mr. Lowe—There is one other important use for oxygen in connection with the gas industry, and that is in the revival of purifying material. In England they use oxygen methods, the most notable one being the Brin. They revive their purifiers as they make their gas by simply letting a little oxygen go in with the gas. Now we do that to a certain extent by admitting atmospheric air, but when we admit air we take in four times more nitrogen than oxygen, and consequently our gas is injured to that extent. If we could put just enough practically pure oxygen into our gas to revive our purifiers as they worked, you would not notice it. If oxygen can be cheaply had, stored in a tank, we can introduce it simply enough.

Mr. Ross—I would like to have you explain the experiment of freezing the flame of a candle.

Prof. Bobrick—You cannot freeze the flame. You can freeze simply the CO_2. The temperature in this kettle is 312° F. below zero. The freezing temperature of CO_2 at atmospheric pressure is 110° F. below zero. Now, the CO_2 striking against the kettle naturally solidifies and is converted into a solid. It is one of the wonders commonly shown in order to say there is some kind of magic. It is not of the slightest value in commerce. What you freeze is actually the products of combustion. It is a kind of white flour. It will disappear immediately in your hand because the freezing point is below the liquefying point.

Mr. Lowe—There is no more striking illustration of this than snow storms in Colorado. The snow evaporates and disappears, notwithstanding that the temperature remains below the freezing point.

Mr. Britton—I feel called upon to say a few words just now. The Pacific Coast Gas Association has been making history for the past 11 years. From its very inception it commenced to do strange, wonderful and original things, and I do not recollect a meeting that has passed but that we have done something out of the ordinary to awaken the attention of gas men all over the world. I think to-day marks an epoch in our history that surpasses anything in the past. We all realize what a treat this has been to us—not only the lecture last night, but also this very scientific and at the same time very simple dissertation, its wonderfully simple demonstrations and the reasons it gives for everything, taking it out of the realm of pure science and putting it on the plane of the common understanding. I am sure he knows that we have a thorough appreciation of his efforts, and a mere vote of thanks seems to be idle words to express it. He realizes how much indebted we are to have a man of his scientific attainments come to us who are struggling in the fog of science, and have him lay before us such great results as modestly as he has. I like modesty in other men; I possess quite a quantity of it myself—not always visible, but always there. (Laughter.) But extreme modesty is to be decried. For the visit of Professor Bobrick and for what he has done for us we are indebted to one man here who has done such things before. He passes them off in an idle way, and does not take any credit to himself. I believe it is proper, in connection with the vote of thanks to the Professor, to tender one also to our dear, old friend, Mr. L. P. Lowe, for his efforts in bringing the Professor here to make our meeting interesting. I want you to know that it is through him that this has been done, as he has done many other things for us in the past, and as I know he will in the future. I now formally move a vote of thanks to Professor Bobrick for his very interesting lecture.

[Carried unanimously.]

Mr. Lowe—I wish to say that I fully appreciate the words of Brother Britton; but I assure you that it has been my pleasure to do everything that I could for the Pacific Coast Gas Association. The knowledge does not all come from me, as it comes *to* me as well. I derive from my association with the gas men of this Coast—the good boys whom you all are—more knowledge than I ever give, and if I can ever be of any assistance to any of you it will give me much pleasure.

Mr. D. Decker, of Santa Rosa, Cal., was then introduced by the President, and before reading his paper on

OUR CUSTOMERS AND THEIR COMPLAINTS,

said: At the time I began to write this paper I realized the enormous amount of business done by the Association, and that its reading might drift along to the closing hour. If so, I thought that if the paper were a short one it would be more especially appreciated. My anticipation seems to have come to pass, so I think you will be more pleased with the brevity of the paper than with its logic.

[For the text of Mr. Decker's paper see JOURNAL August 24, 1903, p. 285.]

Discussion.

Mr. Lowe—I am very sorry that every employee of a gas company who comes in contact with the public could not have heard smooth, suave, sanctimonious "Dan" tell us about it. If you could only imitate his way of "smoothing you down" you would be all right. That is exactly the idea. I agree with him if the manager succeeds in getting that spirit into those who come in contact with the consumers you will remove 90 per cent. of complaints.

Mr. Wiester—I am not much of a talker, unless it is in the way of conversation. I am much pleased with the paper just read. If we had the kind of employee described in all our gas companies, the latter would be at a decided advantage. If I had a printed copy of that paper I would hang it up on the different floors of my building. I think it would have a great effect. I tell you the idea put forth by Mr. Osborn, to "first search ourselves for vices and our neighbors for virtues," is a good one. I like to see a man go according to Ben Franklin's rule: "Take things always by the smooth handle." Take a man in a bad humor, and he will feel an affront from a gas company with speed. A sort of ill feeling exists against gas, telephone and railroad companies, so a good many are really sore to start with. First talk with your injured one until he quiets, then show a disposition that he shall be served, even if it does cost the company something. If he is mistaken, after you get him quiet you can show him that it is a mistake. It is a good way to work. I wish I could run that rule more thoroughly in my own establishment. It would give me a great deal of satisfaction. We are all liable to tread on someone's toes without knowing it; but when we convince him it is not our intention it is like the case of the schoolboy who got a lick over the head from his neighbor and began to cry. The other boy came running up and said, "I didn't intend to do that." "Well," said the boy who was struck, "If you didn't intend it; then it's all right." It is very much the same with men as with boys.

Mr. Britton—I don't want to go on record every time as being the man who was talking, but I cannot help indorsing everything that Mr. Decker has said. You will, to use a homely expression, "Always get more flies with molasses than with vinegar." It presupposes that at all times every man can be a gentleman when dealing with another man who is not a gentleman, or who does not act like one. I can always give excuses for men having the very trying employment of dealing with the public through any quasi-public corporation. You must imagine that at all times their livers and kidneys are in absolutely perfect condition. A man to deal with the public should be a man of extreme sobriety in life. He should live so that his system should never become disorganized. He should be the same every morning, seven days in the week. His temperature should be normal, his pulse regular. That is an ideal; and the ideal man is not very apt to be the manager of a small or of a large corporation, at a small or a large salary. But to my mind that paper of Mr. Decker's deserves to take rank with the "Message to Garcia," which has attracted more attention in the United States and in Europe than any paper written in this century. It was the case of a man who was sent to do a thing, and who did simply what he was told. The man who is in charge of the interests of a corporation should remember that while in his office he is the servant of the public. He should at all times have a polite answer to turn away the wrath of which Mr. Decker speaks. He can thus make more money for himself and more money for his corporation. That "Argus-eyed man," the general manager or president, knows what is going on about him; he would be false to his trust if he did not; but the man who in the conduct of his office makes friends for the corporation is at the same time making a strong friend for himself in the "Argus-eyed one" who is watching all his doings. It pays also from the standpoint of the regard in which you are held by your fellow men of your community. To be looked up to as a man who has made friends is worth more to a man than than any other emolument he may receive at the hands of his corporation. And no better business sermon was delivered from any pulpit than the little sermon friend Decker has preached to-day. I hope every man here to-day who is serving the public will take his

sermon to heart and go back to his bailiwick determined to be good to his consumers.

On motion of Mr. Martin the thanks of the Association were tendered to Mr. Decker for his paper.

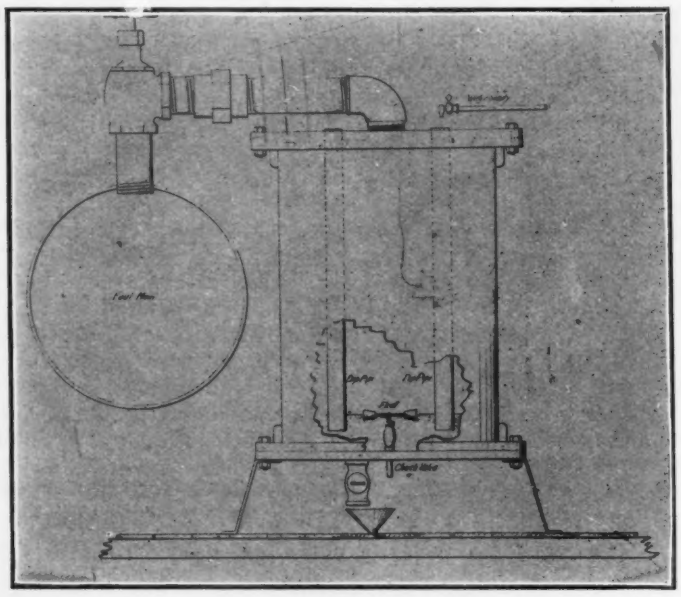
Mr. G. S. Colquhoun then submitted, as Editor of the

WRINKLE DEPARTMENT,

the following:

I take pleasure in thanking the members for the contributions to this department. While there has not been as many Wrinkles sent in as there should be, those that have been are, I think, of sufficient interest to warrant your attention.

No. 1.—*Air Pot for Continuous Revivification of Purifier Oxide.*—By B. H. Petley, Seattle, Wash.—The accompanying sketch shows an air pot for continuous revivification of purifier oxide, as used in Minneapolis, Minn., and which has been working successfully during 8 months in Seattle, purifying upwards of 150,000,000 cubic feet of coal and water gas without a change of boxes, though previous to its use it was necessary to make a change about every 2 weeks. The pot may be made from a 10-inch to a 12-inch flanged nipple, about 16 inches long, to each end of which a plate is bolted, making a gas-tight joint. The upper plate is tapped for a 2-inch connection with the foul main and for

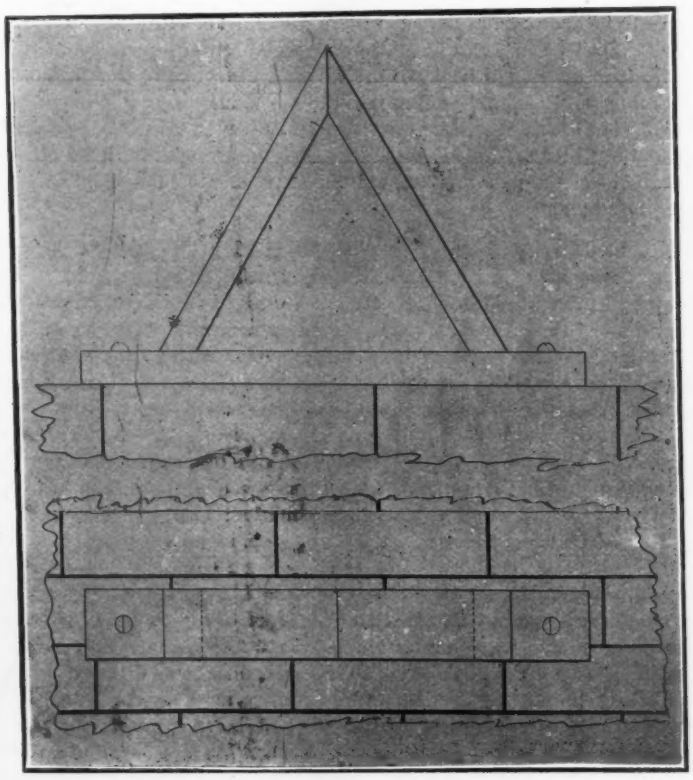


Wrinkle No. 1.

four 1-inch dip pipes, about 12 inches long, that are used to convey the air to the interior of the pot. The bottom plate is tapped for a ¼-inch water overflow and a ¾-inch drain pipe for removing the tar accumulation. A uniform seal on the dip pipes is maintained by means of a vertical check valve used as an overflow, which is opened by means of the raising of a cork float, made of a piece of stiff wire soldered to the valve, to which a cross wire carrying corks is attached. The quantity of air introduced is controlled by the speed of the exhauster, after setting the 2-inch angle valve on the connection with the foul main to the opening required for the revivification of the material.

No. 2.—*Grate Bars.*—By E. C. Jones.—The only by-product of crude oil water gas manufacture is lampblack mixed with heavy oil, tar and pitch. This material is an excellent boiler fuel, but requires care and skill in handling in its use. One of the difficulties and sources of expense in using lampblack as fuel is to get a good grate bar that will be durable. Ordinary cast iron grates and the various herringbone and other patterns will not last and require frequent renewal; the cast iron bars become heated until they sag and burn out. The remedy for all this was found by using round, wrought iron bars as grate bars. These bars are held in place and properly spaced with corrugated cast iron grate bearers, one placed near each end of the bars, while the center of the bars is supported by a flat, cast iron bearer. The corrugations in the bearers enable the fireman to rake up his fire and disturb the bars in any way he pleases, while it is impossible for them to drop through into the ashpit, and they are very easily returned to their notches in the bearing bars. The wrought iron bars last a long time, and in the event of sagging by overheating they may be taken out and straightened on an anvil and put back again. The use of the round bars is a saving in expense and a great convenience in firing the boiler.

No. 3.—*Meter Shelf.*—By R. P. Valentine.—This shelf is made of pieces of gas stove grates painted black. The sticks are cut to the desired length, and shaped by means of a miter box and saw, so they can be placed together in the form of the Greek letter Delta, the base of the



Wrinkle No. 3.

letter projecting 2 inches on each side. The shelf when placed under a meter presents a neat appearance, and will not collect moisture when out of doors. The cost of the shelf will not be increased by using the nails from the stove crates.

No. 4.—*Means of Erecting and Operating Gas Arcs for Street Lighting.*—By Geo. Keaton.—This is accomplished by using two universal joints, one at the lamp and one at the pole. The lamp is lowered

Wrinkle No. 4.

by means of a wire cable similar to that of electric street lamps. The lamp is lighted and turned off by means of two cords fastened to the pole, well above the reach of traffic.

Discussion.

Mr. Colquhoun—While on a recent visit to Gilroy I saw that Wrinkle. One point I requested Mr. Keaton to bring out was how much it cost to maintain the mantles in this swinging arc in comparison with the outside Welsbachs burned in his stationary lamps. He said there was some difference, that the mantles in the suspended arcs did not, of course, last as long as those which were more solid. You will find this

very neat and efficient, giving a fine light equal to a series electric arc.

No. 5.—*System of Filing Gas Literature and References.*—Notes and clippings, which one often would like to refer to, are to be pasted on cards to be arranged alphabetically in a cabinet or drawer. In addition to these, other cards can be added on which are written references to the subjects of interest in books of the works' library, as well as trade catalogues (giving also file reference in the case), and drawings, in case such are kept in drawers, giving number and drawer. The details of such a system of filing references will be worked out by each in his own way, but the idea is a good one and will assist in forming the habit of studying one's business.

No. 6.—*How to Connect an Oil Meter.*—By C. L. Arques.—Having been closely identified with the trials and tribulations of crude oil consumers, I offer the following for what it might be worth. Intelligent operation of steam or gas plants requires accurate record of oil consumption. With the advent of the extended use of crude oil, meters were in numerous cases installed which were afterwards discarded. In nearly every case, however, they were discarded on account of inaccuracy, due to their being improperly connected. The writer remembers, with a great deal of good humor, the case of a steam plant to which he was supplying fuel oil. A tank gauge was prepared, but the proprietor said, "Oh, no; I will settle this matter; I am going to put in a meter." The writer, having been a gas man, said he was satisfied with a meter and that he knew that meters as a rule were villified without reason. When the end of the month came I went around to read the meter to see how it compared with my record of tank wagon deliveries. The proprietor told me that the meter was out of order. It was out of order, because if the bill had been paid according to its reading, it would have been much higher than the quantity actually consumed. The reason was very apparent. The meter had been connected in the oil pipe line between the heater and the burner. As a consequence, the coefficient of expansion of crude oil being considerable, the meter registered the increase in volume due to heat. It was also found that a considerable quantity of gas was passing with the oil, and the meter, not being connected so that the gas could be taken from the oil before it entered the meter, this gas was also measured. In connecting oil meters it has been found that, in order to obtain the best results, the meter should be carefully selected for the rate of flow which will be required of it, and that it should be connected in the oil pipe line, so that the oil which enters it is not of a high temperature. This result can be secured by placing the meter between pump and heater. Care must be taken that no gas enters the meter with the oil, otherwise the registration will include both the oil and the gas. A vent pipe, provided with gauge and air cock at the top, can be inserted in the line of oil pipe before it enters the meter. This air cock can be opened from time to time and the gas allowed to escape. Oil meters as a rule are provided with pet cocks, or tapped so that they can be inserted for the purpose of allowing the escape of the gases.

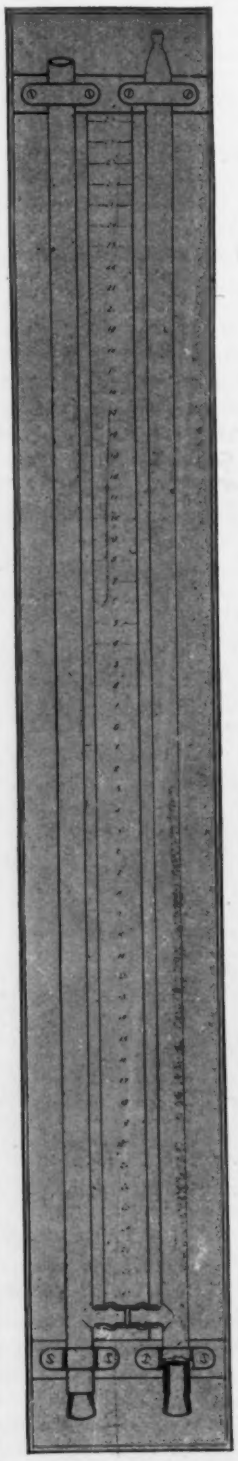
Discussion.

Mr. Arques The purpose of this wrinkle is to do away automatically with the accumulations of gas. The gas collecting in the cylinders of the meters necessarily lessens their cubical contents. If the space is partly filled with gas you get an over-reading. An oil meter never reads less oil than it passes. It reads more, because the strokes of the meter account for the entire cubical contents, and if the meter is filled with gas you never get it. The accumulation of the gases should be taken away automatically.

No. 7.—*Pressure Gauge.*—By A. J. Vanderwhite.—Recent developments in gas manufacture have made it necessary to maintain high pressure about the works. In order to easily and correctly measure this pressure elaborate and expensive pressure gauges have been employed, and the object of this wrinkle is to provide a pressure gauge which will be at once efficient, neat and inexpensive. A gauge of glass and rubber with no metal parts can be made by having a glass worker draw a T on the bottom of each of two long German glass tubes. These T openings are connected together by a piece of rubber tubing and the bottoms of the tubes are closed by rubber stoppers. These two tubes are clamped to a piece of board by ordinary pipe straps, and the gas inlet is connected by means of a piece of rubber tubing attached to the top of one of the rubber tubes. A pressure gauge of this kind may be made at a cost of less than $1, is easily cleaned and is attractive in appearance.

Discussion.

A Member—I would like to ask how to cleanse the inside of the tube?



Wrinkle No. 7.

Has anyone found a reliable method for cleaning the inside of a gauge glass without breaking it?

Mr. Lowe—Drop a piece of string through, with a little leaden shot if necessary. Saturate a piece of waste in gasoline and pass it through two or three times. I have had no trouble under those circumstances.

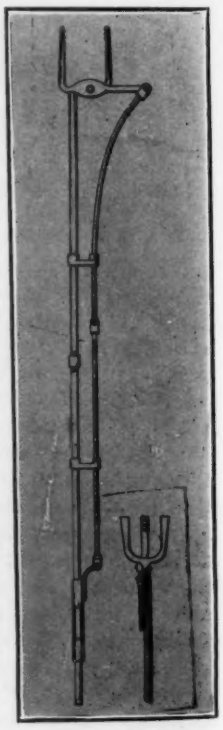
Mr. Ross—I have used wire and wrapping it from one end to the other, and still have broken my glasses. The only way is to take a piece of waste with a string on each end.

Mr. Lowe—Glass manipulators invariably clean by putting a little waste in the center of a string. This form of gauge will enable you to do it well.

The Secretary—In my opinion the remedy for that is simply to clean your glasses oftener.

Mr. Lowe—If you try to clean a gauge glass with a piece of waste without a solvent you cannot do it. A little benzine or caustic alkali of some sort (anything that will cut the dirt) must also be used.

The Secretary—Mr. Vanderwhite has given considerable attention to this matter, and has had a good deal of experience with it. In the North Beach Station of the San Francisco Gas and Electric Company there were some 30-inch gauges with special brass fittings made to receive the glass tubes. They were cemented into them. There was constant difficulty in getting them clean. The outcome has been the development of this gauge. Its simplicity is what recommends it. It is simply two straight pieces of glass tubing with side outlets. These side outlets are connected with a rubber connection, and then the tubes are clamped on to a board. One end of one tube is drawn down suitably for the rubber connection—even a piece of mohair tubing such as used for connecting gas stoves will do. The gauges can be taken down and cleaned easily. It gives you a straight tube right through. The ordinary small pressure gauge, of course, is inaccessible. You cannot get at it. It is even difficult to get a small stick or wire into it. These things are just as simple as it is possible to conceive of anything being made. I do not know exactly as to the cost. I think Mr. Vanderwhite intended to have some figures here. I imagine it is very much cheaper than any other form of gauge ever presented to the gas man.



Wrinkle No. 8.

Mr. Lowe—There is a gauge manufactured similar to Mr. Vanderwhite's with a metal connection at the bottom, but I believe that this is very much better, and it is certainly cheap. The great trouble with large gauges is their high cost. If you purchase a 36-inch gauge you pay $10 or $12 for it.

The Secretary—The very point intended to bring out was the absolute simplicity and cheapness of the gauge. It can be made anywhere. You don't have to get castings, threads or anything of that sort. It is simply two straight tubes (made by any glassblower), a simple board, a couple of little straps and a piece of rubber tubing.

No. 8.—By J. R. Thompson.—This is a tool for placing checkerbrick in a hot generator or superheater. The accompanying drawing is self-ex-

planatory. Members who have had to re-checker small generators will appreciate its value.

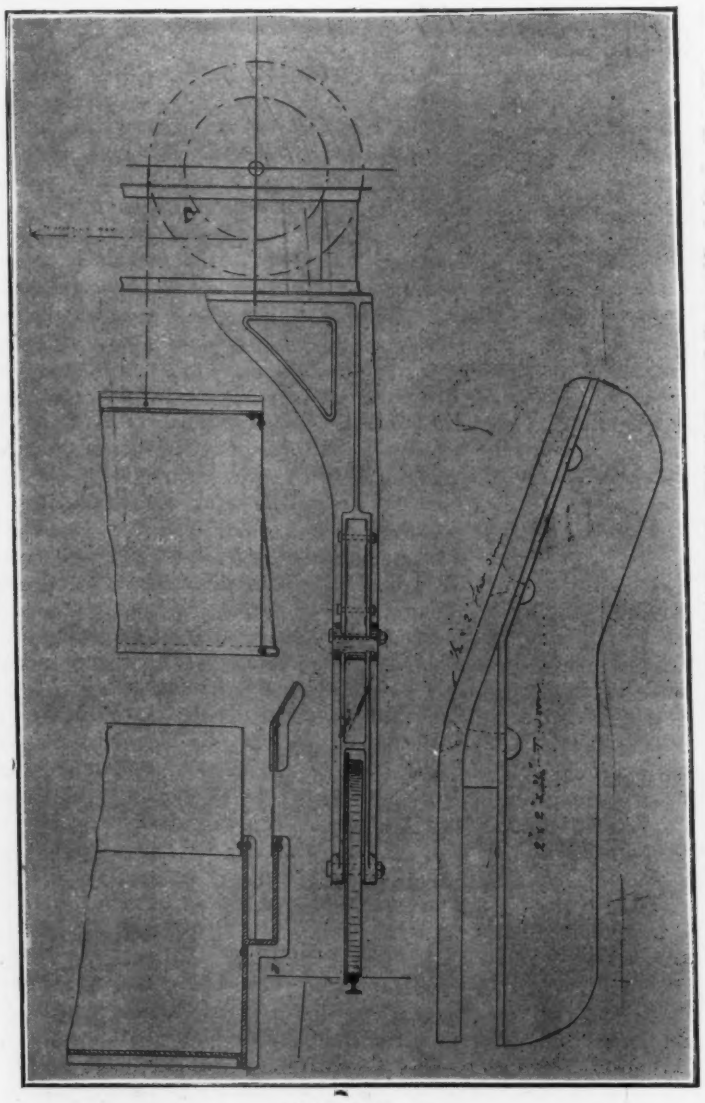
Discussion.

The object of this wrinkle is to take a checker brick and put it on the inside of a hot shell.

Mr. Lowe—Is it for sale? For many years I placed checker brick in the top of a hot generator by using a sort of tongs similar to the ice tongs you use on your dining-room table. A sharp jerk would release a clamp and leave the brick where you wanted it, but this wrinkle is much better because you can also place the brick in through the doors horizontally. I wish it were on sale. Is it a patented device?

Mr. Thompson—No, it is not patented.

No. 9.—*A Device for Sliding Purifying Cover into its Seal.*—By F. Foveaux.—I found this a very useful appliance. It is cheaply made and saves a great deal of annoyance and expense. In my case I found it almost impossible to lower the cover at our works without having

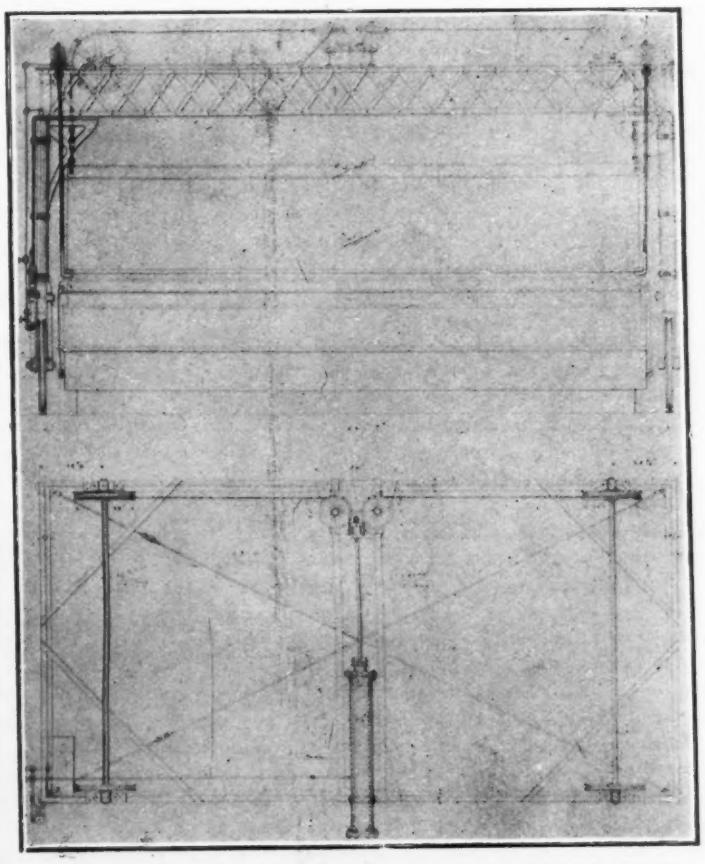


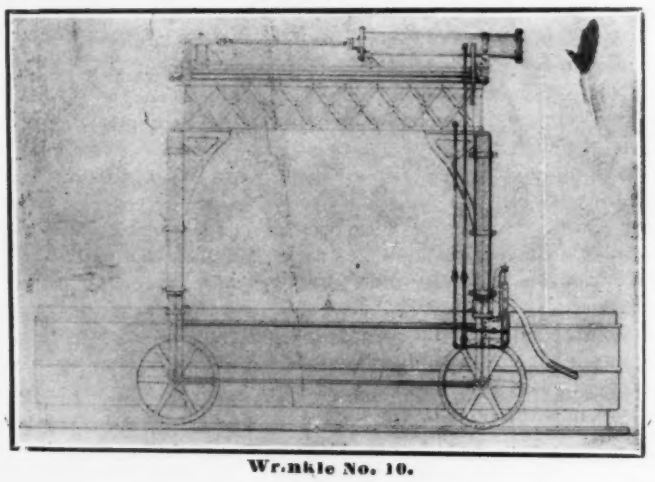
Wrinkle No. 9.

from 8 to 10 men assisting. This little device replaced all the men but one, and he is doing it now all alone. Our boxes are 20 feet square, 3 sliding shoes to each side, 12 in all, which causes the cover to slide easily into its place.

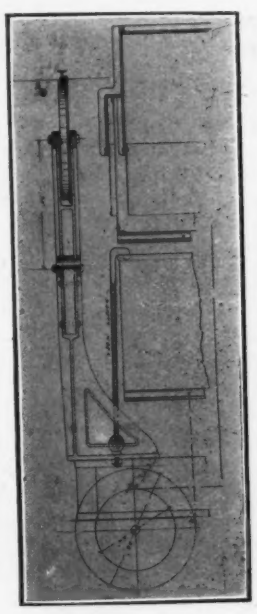
No. 10.—*Traveling Hoist.*—By F. Foveaux.—There is nothing new in using hydraulic lifts in purifying houses. Our carriages were equipped with screws. It was a very hard pull for 8 men to raise the cover. I found it necessary to relieve the men of their hard labor, as well as to reduce the expense in the purifying house. I happened to have some of the details to change the carriage to a hydraulic lift. I placed a couple of 6-inch "I" beams across the girders, a cylinder which I had on hand, some sheaves, wire rope and hand pump. All this was of small expense and now a child should be able to raise or lower the cover.

No. 11.—*Safety Hook for Suspending Purifier Cover.*—By F. Foveaux.—In any case a hook of this description is a very useful and





Wrinkle No. 10.



Wrinkle No. 11.

reliable appliance, and it insures its safety in moving the carriage with its cover over the boxes. Four hooks are suspended from the top of the carriage as shown in the drawing. (To be Continued)

The Need of Cheaper Gas.[1]

By Mr. C. E. Jones, Leyton, England.

Speaking at a recent meeting of a Metropolitan Gas Company, a shareholder affirmed that too much importance appeared to be attached to "initial price" and too little to the "selling price" of gas; and he declared that what was of supreme importance to the consumer and shareholder alike, was the figure at which gas was sold. In this connection, the speaker asked what would become of the initial price in the event of a rate-aided or cheaper *illuminant* superseding coal gas in that function. The Chairman courteously replied that, under such circumstances, "not only the initial price

1. *Journal of Gas Lighting.*

would go, but all the capital and everything else would go." This predictive utterance of so eminent an authority appears so startling as to invite comment, inasmuch as what is true of a part, must be true of the whole—*ergo*, not only would the subscribed capital of the Company in question be sacrificed, but the aggregate capital (some £125,000,000 sterling) employed in the gas industry would have to go also! So disastrous would this contingency be, and so far-reaching its effects, that one hesitates to accept the dictum. The following considerations suggest themselves to the writer, who proposes to discuss and criticize, more in a general than a particular sense, such an eventuality; and what the reader is asked to bear in mind is the possible withdrawal of the *lighting* section only—admittedly at the present time the most important—from the gas industry.

But does it necessarily follow that the subscribed capital and everything else would go by the board, and the companies into liquidation, because of the loss of one source of income? Would gas enterprise languish and destructive distillation die? Would Othello's occupation be gone utterly? Emphatically no! Had coal gas no economic function other than the production of luminosity, and was incapable of evolving heat, or producing motion, then the verification of the prediction is possible. But this is not yet. There is a large and expanding sphere of usefulness for coal gas outside artificial illumination. To illume the dark places of the earth is only one of the many useful services that coal gas performs for mankind; and it is by no means demonstrated that, without the lighting business, the industry would become extinct, and "everything would have to go." Say, rather, it is terminable with the exhaustion of our coal measures, which are computed to last 500 years at least. Coal gas possesses numerous and peculiar inherent qualities of its own, commercially valuable. It therefore follows that its manufacture will not cease so long as the raw material is obtainable. The destructive distillation of coal would be indispensable to many manufacturing, chemical, and other industries. With gas for heating purposes and motive power, its ammoniacal compounds, derivatives of tar, and the solid residuals of pitch and coke, will insure the future of the industry; its capital is already subscribed; its operations are now active; its machinery and staff in working order.

Steam.—Wonderful as have been the achievements of steam during the past century, it is morally certain that the triumphs of gaseous fuel during the current one will eclipse them. Steam for small powers is doomed, and gaseous and electrical energy in the ascendant. The thermal power of coal gas renders it most suitable for engines up to 100 horse power. Experience with even larger machines will shortly be available. Comparing Mond gas with a putative thermal value of 125 units, Dowson with 150, blue water gas 300, and coal gas (without foreign admixture) (say) 650 units, it is surprising that the latter does not hold the field. The explanation is very simple—coal gas is too dear, and in some towns the selling price is prohibitive for power purposes, except on a very restricted scale. It should not be forgotten, however, that either of the cases of the competitive gases named require larger engines, and more gas to perform the equivalent duty, volume for volume, than that obtainable from coal gas. The lower the calorific value, the larger the engine, and the more gas per exploding charge required. This difference is as much as 5 and 6 to 1. In calculating the relative value of these powers, however, allowances should be made in respect of space, foundations, cost of machinery, etc. One important consideration in favor of coal gas in motors, is its reliability of firing, which others seem to lack, though it must be conceded they are much cheaper than coal gas. Again, it only needs to emphasize the fact for the information of gas directors that the selling price militates against its universal adoption. When this is reduced, such an impetus will be given to the industry as to amount to a national benefit. The author of these lines remembers when coal gas fetched 11s. per 1,000 cubic feet, and was unremunerative at the price. Thanks to improvements in manufacture, 3s. now fails in the field of effective competition; and a further reduction is demanded to enable it to compete with its rivals. How to reduce the selling price without friction or injustice to existing interests, is the problem set before us. It appears to the writer that there are more ways than one to accomplish this.

Reducing the Illuminating Power.—This finds favor with many engineers. With some, it is assumed to be all-sufficient for the needs of the moment. A judicious lowering of the candle power of a high grade gas offers many advantages to the consumer, and is the correct policy. But even this is no panacea, and in practice it may be carried too far. What the happy medium is, however, will probably be determined by local rather than national wants; but coal gas with less than 500 heat units is not likely to remain a popular fuel. It is essential, therefore, that its distinctive qualities should be preserved, one of which is its calorific value. Destroy this, and its absolute superiority over other gases is gone. There is nothing to be gained by reducing it to the level of Mond gas, whose advent is not calculated to seriously affect the fortunes of coal gas, so long as the latter retains its characteristic chemical and physical composition. Drastic changes in this respect should be well considered, or the end will be disastrous.

Inflated Capital.—Over capitalization is a gigantic evil afflicting joint stock enterprise; and the gas industry is not entirely free from the effects of the system. Some gas companies still retain capital charges for which there is no visible asset. The legal extraction of dividends on obsolete or disused capital in perpetuity, is an undoubted hardship on the consumer, indefensible on moral grounds; and the sooner the practice ends, the more stable and intrinsically valuable will gas property become. A reduction in capital, however brought about, means a lower selling price; and now that the oldest and largest gas company in the world has voluntarily agreed to adopt the principle by the redemption of £1,000,000, or about $\frac{1}{16}$ of its subscribed or $\frac{1}{26}$ of its nominal or unified capital, other similar over capitalized concerns would do well to follow the example, until this bone of contention is buried.

The Directorate and Local Rates.—In these thriftless days, it is almost hopeless to expect relief from that incubus on trade—local rates. But it is not unreasonable to expect those responsible for the administration to safeguard the industry in future from unjustifiable and periodic assessmental increases, already much too high. Tacit consent in this regard encourages the squeezing process, and is inimical to cheap gas; and tame acquiescence invites renewed attack, even when the value of the hereditament affords no justification for increased ratable assessment. Apathetic boards of directors are no match for the rate-equipped parochial authorities and their advisers; so they exercise their hereditary prerogative of grumbling, and "pay, pay, pay." Grievous as the burden has become, it is more likely to augment than to decrease; so any hope from this quarter is but faint, and might be abandoned. One day local taxation and its incidence may be revised, and the attempt will create as great a furore among municipalities as the Chamberlain fiscal problem is now doing among the dovecotes of Free-Traders. "Thus the whirligig of time brings in his revenges."

Fields of Promise.—There are at the present time preserves hardly touched by purveyors of gas—immense fields of usefulness only partially cultivated, some not at all—in the United Kingdom, more especially within the Metropolitan area, or Greater London (which comprises over 701 square miles, and has a growing population exceeding 6 millions) awaiting development, calling aloud for gas, for mantles, motive power, cooking, heating, workshop, and other multifarious purposes, to which it is so admirably adapted. These would-be consumers care nothing for "initial prices," "sliding scales," or "sulphur compounds;" their requirement is cheap gas to supersede, as far as possible, the use of smoky coal, and sweep away at one stroke all of its concomitant array of nuisances, insanitary inconveniences, and wasteful expense. By the use of gaseous fuel, these are all easily abated, the atmosphere purified, and the employment of dangerous steam boilers in densely populated localities becomes unnecessary. Gas motors would be welcomed by the legion of small traders in the kingdom, if let on hire. Why are such machines not obtainable like other goods on the hire system, with option of purchase? Apparently, because purveyors of gas do not want the trade in small powers. It would be as easy to let out motors as to provide gas cookers on the system, or gas fires, or other apparatus, on easy terms. Whose duty and interest is it to minister to the wants of those small traders, machinists, or little "mes'ters?" Why, purveyors of gas decidedly. Why should they be relegated to the care of the electrician and oilmonger? "Here, then, is a land of promise; go ye in and possess it."

Domestic Gas.—Again, in domestic life, gas, so to speak, is only on the edge, the very threshold of its possibilities. With a slight diffusion of technical knowledge (not much would be needed) among consumers, all this would be changed to the manifest advantage of suppliers of gas. Gas exhibitions, cookery lectures, and the like have done good work, and merited our thanks. But they have had their day. They have succeeded in removing much of the popular ignorance enveloping gas, which is something to be thankful for; but the busy housewife found it inconvenient to attend the "course of lectures." True, gentility never lacked representation, and leisurable ladies of the kill time order were much in evidence. But those most in need of instruction were conspicuous by their absence; and the project has failed to reach, in anything like entirety, that majority of householders to whom lack of means, or other causes, render "plain cookery," in view of elaborate confections, an absolute necessity. How to interest this larger class of

would-be consumers is the question. Can we cultivate a good understanding with them—educate them in the economic use and control of the most useful domestic servant of the time? A "general" who is ever at hand, silent, always willing to oblige, a pattern of cleanliness, a model of sobriety, asks for no holidays, wants no privileges, entertains no followers, accepts the smallest salary, if desirable can always be put out, and never goes on strike by day or forsakes you in the dark lone night, a cheerful companion, an old and well tried friend—viz., coal gas. How the good and ill of life depend on well prepared meals! Bad cookery is responsible for much—even loosening the silver cord, dissolving the golden bowl, smashing the pitcher at the fountain, and breaking the wheel at the cistern. Are not hunger and villainy ever associated? Cassius, doubtless, had an incompetent cook, which accounts for his "lean and hungry look." Had his culinary arrangements been well ordered, Cæsar might have escaped assassination. Our own King Alfred, having no handy mechanical means of regulating the heat, unwittingly earned his historical reproof for burning the cakes; and to half-cooked eels, Henry I. owed his premature decease. Ancient and modern instances might be multiplied *ad infinitum*, of the toll paid for neglecting this branch of education. Pathology abounds in such cases. In the gas cooker we have an enemy to that waste which brings woeful want. By its use, food is economized, dyspepsia annihilated, and social cheerfulness (the product of good digestion) diffused, mental and physical powers are nourished and maintained, and human life is prolonged. By its instrumentality, the preservation of that gem, that jewel of femininity—now so rare—a careful, thrifty housewife, "who riseth and giveth meat to her household," may yet be assured.

A New Departure.—In order to accomplish these *desiderata*, the author proposes the employment of ladies of good address, duly qualified in gas technics, with practical knowledge of apparatus usually employed, or that might be used, in dwelling houses, to visit all householders—not exempting "flats"—in the district of supply, to remove the fears of the timid, strengthen the half-hearted, enlist the wavering would-be user, give advice when and where required, and gratuitously instruct all who desire to learn the most approved methods of preparing food, the use of the various forms of cookers, gas burners and apparatus generally. In a word, send the instructress from the platform to the home, from the town hall to the kitchen, where the mistress of the house, the cook, daughter, or other person usually entrusted with domestic duties, would personally receive, and duly appreciate, such advice and instruction. To newly married ladies whose opportunities, through no fault of their own, for acquiring sound knowledge of food preparation have been scanty, or few, such information would be an inestimable boon. Many a young wife would gladly receive instruction at home where her deplorable ignorance of cookery would easily be removed, without the ordeal of publicly proclaiming it by attendance at a cookery class. Even man tries at times to appear cleverer than he really is; and it is cruel to expect a young wife to confess her ignorance of good domesticity. In public, at all events, she will not do it. Yet a knowledge of the best means of preparing the ordinary everyday food used in the home would be a positive blessing to hundreds of thousands of wives, husbands, fathers and children, and more especially valuable in the case of infants, invalids and aged persons. On physical, hygienic, national and other grounds, such a scheme is to be commended; for does not an old English proverb declare that "Heaven sends us good meat, but the devil sends cooks?" If gas managers will render any future applications for cooks at His Satanic Majesty's registry office unnecessary, they will confer a favor on the angels of darkness, and win golden opinions from all mankind. Similar instruction in the use of the mantle, gas fires and other appliances could, of course, be imparted equally well, and in fact better, by a lady of address, than by a "mere man," however nice his deportment may be. To enroll such an official on the staff of the larger undertakings should be easy, and a liberal emolument would be an investment realizing a high rate of interest, besides securing numerous collateral advantages in the promotion of better relations between buyer and seller, and the removal of the prevailing prejudice and ignorance, so injurious to the reputation of the companies and preventing an increase of business and the spread of gaseous fuel. Smaller provincial undertakings could combine and jointly bear the expense of such an officer. But the post should be a permanent one; and the question of providing full and suitable employment—where office routine obtains, and showrooms are kept—is a mere detail.

Objection Answered.—To expect such a scheme as is now proposed to be adopted at once by conservative chairmen, apathetic directors and dividend-hunting shareholders would be to betray a want of acquaintance with human nature and the "little ways" of gas companies. It might be truly said that the gas industry has attained to its prosperity with a minimum of aid or encouragement from directorial administration. Ingenious inventors and enterprising manufacturers, and the world's demand for more light at the opening of the Victorian era, are potent factors to be taken into account; and if the industry has forfeited the confidence of the consumer—is waning in popularity and losing custom—the fault is to be found in the board rooms, where, according to one authority, there is much "incompetence."

Oil.—High priced gas has created the only effective competition it has to fear—viz., mineral oil. Electric light, on account of its cost, remains the light of luxury and of the fickle Dame Fashion. The majority of gas users are neither fashionable nor luxurious; but they demand, and mean to get, value for their money. Finding that foreign mineral oil was cheaper than gas, more easily obtainable, payments easy and less troublesome, and the vendor of lamps and the oilman so obliging, they supported the foreign importation to the exclusion of coal gas, the native product. Gas directors looked on while this trade, practically exempt from local rates and Imperial taxes (which hamper and menace native joint-stock enterprise), has grown to prodigious proportions, and actually arrested the former expanding ratio of "increased consumption" of gas; in other words, seduced new customers who were reasonably expected to use coal gas. This is indeed an effective competition which should "wake up" drowsy gas administrators to the danger which threatens them by perpetuating the policy of high initial prices, dear gas, and a blind optimism, begotten of Special Acts of Parliament, and misplaced confidence in the exploded idea of gas monopoly, ignoring the effective competition of rival lights.

Conclusion.—The gas industry should set its house in order, stir up the dry bones of indifference, get off its stilts, adopt modern, up-to-date methods to secure increased business, keep down capital, watch and avert additional burdens, proclaim, in a manner that can be "understanded of the people," the inherent qualities and advantages of coal gas, remove from the consumer the mantle of nebulosity with which ignorance and prejudice have arrayed him, give him technical advice and help in the industrial as well as domestic use of gas at home or at his place of business, and, above all, sell the staple article best suited to his requirements, and at a price within the reach of all trades and classes of the community. Gas is necessarily progressive in its domain; no "rest and be thankful" policy is possible. Stagnation is akin to decay, and decay is death. The remedies are within reach and easy of application. The author has witnessed many new departures in gas affairs, and hopes to see others before the resources of the industry are allowed to be diminished, exhausted, or superseded. With "due care and management" neither capital nor anything else need "go"—except it goes forward.

Some Curious Steam Engines.

By Mr. Egbert P. Watson, in *Iron Age*.

Over half a century ago there was a curious steam engine at work on the East side in New York city driving a saw mill. It was simply a reacting engine, having no valves, pistons, connecting rods, or any of the details usually found on steam engines. In design it was the same as the lawn sprinklers in use at the present day, having two arms revolving horizontally at the top of a vertical shaft, the arms being hollow and pierced with small holes at their extremities. I think the arms were also slightly curved at the ends. Steam entered the vertical shaft, and issued through the holes, and the reaction of it upon the atmosphere generated a certain force. I do not know what pressure was carried, but it was not great, probably, for in those days boiler making was by no means an exact science, and 50 to 60 pounds was considered good work. This engine, as regards its design, is one of the first applications of steam, being credited to Hero some years before the Christian era, but it ran a modern saw mill successfully for many years, until it was finally broken up for junk.

Another curious engine was much more modern, having been designed by Horatio Allen, and built at the Novelty Iron Works in New York city some time in 1859–1860. This was a pendulum engine, so called, from the fact that the cylinder, about 40 inches in diameter, was swung from its upper head (the cylinder being vertical) instead of trunnious, as in an oscillating engine, and in other respects similar to the last named type. It was never duplicated, not having any especial advantages over ordinary engines.

An engine with a fixed crank was a novelty many years ago, the cylinders, two in number, being attached to a flywheel revolving around the crank, but this had manifest disadvantages, and I do not know that any of them were ever put to commercial use.

During the Civil War William Wright, a well known engineer of

the period, designed an engine which was a decided novelty in motors of its kind. The cylinder was in the form of an annulus, or ring. It was not a complete circle, but a segment of one, and the piston traveled through an arc in making its stroke. As may be imagined by machinists, this was a very difficult cylinder to bore, and the piston was equally bad to turn true, but both problems were successfully solved by special tools designed by Mr. Wright. This engine was put into the United States gunboat "Pequot," but did very little service.

Aside from curiosities of general plan and design, there are instances of a want of knowledge of first principles, which seems te be general at times, for they are patented over and over again. One of these is the cylinder with two pistons in it, the impression being that if one is good two must be better, the result showing that the power developed is the same in both cases.

The ends aimed at in the early days of the steam engine seemed to be to provide unique valve motions or peculiar actions of the details generally without any knowledge of how they would answer, or what especial end was to be gained by them. So long as they were novel and unlike any engine previously made, the designer was satisfied, but unless it was proved that the changes were in the direction of economy manufacturers were not, and their popularity was short lived. In these days everything is subordinated to economy of the working fluid. An engine may be as ugly as sin, or the most perfect piece of mechanism that was ever devised, but if it saves coal it assuredly "fills a long felt want."

Purchased Electric Power in Factories.

[From a paper read by MR. E. W. LLOYD at the last meeting of the Association of Edison Illuminating Companies.]

The growth of electric power loads in central stations during the past 10 years has been no less than marvellous. There is scarcely a member of this Association who does not remember the time when the installation of a 10-horse power motor on the Edison system was an event known to every employee of the company, and commented upon fully as much as the connecting of a 500-horse power installation at the present time. There is scarcely a doubt but that the connected central station power load in large cities will equal the connected light load at a very early day, as the removal of large isolated plants in office buildings and mercantile houses has increased our power loads with leaps and bounds. The time has come, however, when we must look to large individual motor installations in factories if our present rate of growth is to be maintained.

The small power customer in large cities comes with little or no solicitation, and need not be considered here. It is of the installation of motors, and the cost of power from central stations for large factories, in comparison with isolated plant costs, that this paper will endeavor to treat.

It seems to be the policy of some companies to offer power rates at almost the cost of production, and in some cases, to go even lower in order to build up a day load.

The experience of one company demonstrates that in a great number of cases factory plant costs per kw-hour were much in excess of what we now sell them current for at a profit.

Low power rates are a detriment to central station business, as these rates are published by customers from place to place, and often business is lost because the prospective customer hears of an extremely low price in another city, where the local conditions, or more often the anxiety of the company to get a power load, prompt them to give a low rate without learning what it actually costs to operate the isolated plant. Before giving a prospective customer a price per kw-hour, it is well to know what his factory plant costs are. In ascertaining these costs you will probably meet with difficulties. The manufacturer with engineering training, or having a mechanical or electrical engineer as manager, thinks he can generate power just as cheaply as we can sell it. We find, however, that a large portion of the customers with whom we ultimately do business, know little of their actual plant costs, and if their estimate of costs is taken, we would find a cost per kw-hour with which it would be impossible for us to compete. A careful investigation of the plant will determine whether their figures are correct. If their system of keeping costs is wrong, it is necessary that the information be estimated from data obtained by going over every detail of the driving machinery, plenty of allowance being made for large coal consumption when the apparatus is over 5 years old.

An important point is the examination of all the pumping machinery. It has been our experience that the steam pump is one of our best friends. Frequently the decision as to whether a plant be operated from central station service, or an isolated plant be installed, is determined by the large steam consumption of the pumps per horse power per hour.

The items enumerated below are those which should be considered in making up the total cost of operating an isolated plant:

Salary of engineers; salary of firemen; salary of electrician; fuel; removal of ashes; water; oil; repairs to boilers; repairs to engines and dynamos; lamps; carbons; tool account; miscellaneous expense and supplies, waste, packing, etc.; general expense; depreciation; interest on investment; insurance; rental value of space; damage resulting from heat and vibration; risk to employees and the public through accidents and boiler explosions; taxes.

In addition to the above plant costs it is often necessary to add the following: Maintenance of rope or belt transmission lines; unnecessary investment in shafting and hangers; salary of millwrights.

Our experience has been that it will generally be necessary to estimate most of the above items, as the customer has not kept these costs separate from other similar accounts. Such items as salaries, supplies, coal and water, are about the only ones that can be accurately obtained over a period of years.

In estimating the kw-hour output of an isolated plant, we have to take into consideration not only the power consumed by the machines themselves, but the friction load of the heavy transmission shafting, and the wastes in the generating machinery. It is also essential that we be familiar with the customers' output, and have a knowledge of the workings of different kinds of machinery, and know the power required to drive each machine, together with the number of hours per day each runs. An estimate made on this basis can be checked by indicator cards taken every 15 minutes during the day for several days. A 1-day test is, as a rule, very inaccurate, as the machinery varies in its operation from day to day. These tests are necessary only in large factories, as a proper estimate of the kw-hour consumption may be made of a small installation without this expense.

Engine tests are very often deceiving, it being extremely difficult to separate the friction load present in all engine-driven plants from the actual power delivered to the machines. It is, therefore, much more accurate to estimate the kw-hour consumption for each machine or group of machines. These estimates can be made quite accurately by an engineer who is trained to the work.

Instances have come to my notice of cases where there was under 5 per cent. variance between the bills and the estimate. Having the plant costs and the kw-hour output of the plant, their kw-hour rate can be compared with the central station rates with gratifying results.

In addition to the favorable comparison of rates, we have the advantage afforded by the lower kilowatt consumption of the machinery after the removal of waste caused by the constant running of generating machinery, shafting, steam pumps, pulleys, belts, etc. These changes in most cases turn the tide in our favor, as, in the majority of factories, the percentage of lost energy is very large.

One of the most difficult tasks we have is convincing a customer that his average load is not equivalent to his connected load, nor is his maximum load the average. It is surprising what a large number of people there are who persist in these views. When a customer is asked how much power he will require, he invariably mentions the horse power of his engine, and when you give him a rate per kw-hour immediately proceeds to multiply this by his hours of running and finds an enormous cost per month.

Besides the ordinary causes of waste above mentioned, there are generally numerous changes that can be made in plants, which will reduce the current consumption materially. If air is used for hoisting and drilling, these machines can be replaced with electric hoists and motor driven drills. Of course, if the plant uses hammers or riveters, the air compressors cannot be removed, but they can be changed to motor drive with an automatic controlling device arranged to start and stop the compressor, as the conditions of operation require. Where it is necessary to have shafting of any length, a saving on the friction load can be effected by the use of light line shafting and 3-point bearings.

In order to substantiate the argument that central station charges are cheaper, the table given below shows costs per month taken from a customer's books for one year previous to the removal of the plant, that are higher than their present current bills from us:

Salary of engineer, $90; salary of fireman, $60; fuel, $577; removal of ashes, $8; water, $20; oil, $2; repairs, $15; tool account, $2; miscellaneous expense supplies, $15; depreciation, $83; interest on investment, $49; insurance, $6; rent value of space, $25; interest on unnecessary investment in shafting, $5; total, $956.

This customer is running about the most difficult class of machinery to which we are called upon to supply power. They carry on a structural steel business operating punches, shears, traveling cranes, a fully equipped machine shop, carpenter and pattern shop, foundry, a 75-horse power beam saw, and a 75-horse power air compressor, having a total of 400-horse power in motors. With a 4-cent rate per kw-hour running 10 hours a day, bills run about $800 per month. We expect to run them for considerably less money by replacing a number of their air hoists by electric, as their air hoists take about 5 times the energy after all wastes are calculated.

The only way we were able to save this firm money was by the elimination of all wastes throughout the plant. Most of the machines have a motor directly connected to them, the exception being the carpenter and machine shops, which are group driven.

These facts demonstrate that proper motor installation is the large factor in reducing the cost of power from central station service. I do not believe it is necessary to follow the advice of some manufacturers of motors in order to have an efficient installation, such as specifying the very large motors necessary for multiple voltage control, where the motor in some cases is 50 to 75 per cent. larger than need be; but on such machines as pumps, air compressors, punches, large machine tools, large wood working machines, beam saws, hoists, printing presses and the like, it is essential that a motor be installed for each in order that the average load be as small as possible.

The two voltages supplied by the Edison 3-wire system, together with the use of any of the numerous mechanical methods of speed changing, will efficiently supply all the range in speed required by any tool with which I am acquainted.

The first cost of a motor installation often militates against us when figuring with a prospective customer for current, but this prejudice is rapidly disappearing as the numerous advantages in favor of motor drive are becoming widely known, and up-to-date factory managers are making changes, whether they use central station current or generate their own.

I believe it good policy to be extremely liberal when quoting costs to install motors, as their sale is really a secondary consideration in connection with central station business. Spread the payments for motors over long periods, with good allowance in case they be taken back. Make a guarantee on the bills per connected horse power per month for a short period; in fact, force the customer to do business when the negotiations get to a point where you are apt to lose him.

I do not mean to take the position that it is necessary to cut rates in order to close a contract, because making a stipulated price per horse power per month does not make the rate. Keep up your rates, but use every possible expedient to get power business by a liberal policy. Some people are afraid of central station charges, and it is necessary to make concessions to sufficiently interest them to make the trial.

In figuring on motors with our customers, we frequently find that we are underbid very materially by makers of inferior apparatus, and the customer is inclined to buy the cheaper machine on account of the saving in the first cost. This is frequently very poor policy on his part, we find there are often machines which are defective in design, and, therefore, take more current than they should. It is sometimes hard, however, to convince a customer that a slight difference of efficiency makes any particular difference. We have figured out the difference in the Edison bills which would be made by a difference of efficiency, from 1 per cent. to 10 per cent., in order that the customer may see in dollars and cents what it means to him on a year's bills.

By studying the table it will be readily seen that a slight disadvantage in efficiency will make what appears to be a cheap motor by far the most expensive in the long run—*e. g.*, assume two motors of 10-horse power capacity each, one selling at $250 and the other at $225. Let us assume that the motor will average 3-horse power 10 hours a day the year around. Assume that the average efficiency of the cheaper motor is 3 per cent. less than that of the $250 one. The annual cost for current would be $20.94 greater. Capitalizing this annual difference on the basis of 5 per cent., we find that the cheaper motor costs $225 plus $104.70, or $329.70 as compared with the $250 machine.

The following table shows annual variation in cost of current caused by variation in percentage of efficiency. Table based on motor running at full load 10 hours per day for 312 days. Current based on 5 cents per kw-hour. When the hours running per day of motors is determined, the actual loss can be easily figured.

My company makes a practice of buying plants, and often the difference between the salvage allowed and the cost of the motor installation is very small.

When there is a plant to be removed we find it to our interest to offer good prices for the second-hand machinery. Often a customer is agreeably surprised at what is offered for his plant and will sign a contract at good figures where he would become dissatisfied and refuse were we to appraise his plant too low.

Per Cent Variation in Efficiency.

Horse Power.	1 per Cent.	2 per Cent	3 per Cent.	4 per Cent.	5 per Cent.	6 per Cent.	7 per Cent.	8 per Cent.	9 per Cent.	10 per Cent.
1	1.17	2.27	3 49	4.65	5.83	6.91	8.15	9.32	10.48	11.67
2	2.32	4.65	6.98	9.30	11.65	13.93	16.31	18.64	21.00	23.00
3	3.49	7.90	10.47	13.95	17.60	20.92	24.50	28.00	31.40	34.50
5	5.82	11.73	17.45	22 75	29.25	34.50	41.00	46.50	52.00	58.00
7½	8.74	16.50	26.15	34.00	44.00	53.00	61.00	70.00	78 50	87.00
10	11.65	23.15	34.90	46.50	58.25	69.50	81.50	93.00	104.50	116.50
15	17.48	35.00	52.00	62.00	88.00	104.00	122.50	140.00	156.00	174 50
20	23.30	46.50	70.00	83.00	116.50	139.50	163.00	186.00	208.00	233 00
25	29.00	58.00	87.00	104.00	146.50	174.00	204.00	232.50	260.00	290.00
30	35.00	70.00	104.00	124.50	176.00	209.00	245.00	280.00	314.00	350.00
35	40.75	86.50	126.50	145.00	205.00	243.00	286.00	326.00	365.00	407.50
40	46.60	93.00	139.00	165.00	235.00	278.00	325.50	374.00	417.50	466.00
50	58.25	117.50	174.00	207.50	279.00	348.00	412.50	467.50	500.00	582.50

We find a good market for all the apparatus we remove at very good prices, and there is no doubt about the value of the second-hand machinery department. We have a gang of expert wreckers who place the machinery in the warehouse in good shape, where it is cleaned up and put in presentable condition for sale. A few well-placed advertisements in trade papers bring plenty of inquiries, and we rarely carry any of the machinery over a year.

Besides the removal of wastes in plants above enumerated, there are other savings which should receive consideration in case the factory where motors are to be installed is a new building. Such as, less investment in line shafting, smaller foundations for the building, lighter roof supports owing to the decreased weight of the shafting and the absence of belts, which allows of the installation of traveling cranes, thereby increasing the handling facilities of the factory, and reducing the cost of the output.

There are also a great many reasons in addition to the actual cost of current why central station service should be used, and before presenting our estimate it is always a wise precaution to bring these points to the attention of a customer. Following are a few of the reasons: Constant smoking, causing the manufacturer annoyance and trouble with the city authorities, who force him to use a high grade of smokeless coal at great cost, or the installation of costly smoke consumers or furnaces. Strikes of engineers, firemen or teamsters; inability to get coal; break-down of transmission shafting, belts, engines or boiler plant, together with the liability of accident in operating a plant where trouble is being had with the employees. Also the large losses being suffered by the manufacturer when accidents occur causing the closing of the whole factory. With reference to accidents: We have a customer who had been operating a plant for the supply of power and light for twenty years. One night about six o'clock the battery of boilers burst, killing nine people and maiming many others. They called on us for temporary service, which we were able to give them by 7:30 next morning, having a construction gang of 65 men working all night. After running them temporarily for a time, an estimate was made for permanent service, with the result that they are now on our system. Their losses, including claims, exceeded the total cost of the operation of the plant for over 10 years. It is needless to say that they will not install a new plant.

Further advantages are the reliability of the service from the central station at any time during the 24 hours, with possibility of running any one tool or group of tools if necessary, without starting a large engine and paying a night engineer and fireman; the privilege of using two voltages from the 3-wire system, insuring large speed variation, especially for individual motors, and a corresponding increase in the output of the plant. Flexibility of the motor installation, allowing an increase in the motive power at very little cost with the additional advantage of a better rate the more power used. Furthermore, the increased cleanliness in the factory, the absence of belts, vibrations, heat, and the increased output (which is a very important point) due to the absence of belt slippage.

I have tried to bring out the point that proper motor installation is the important one to consider when figuring on new business. I wish to emphasize this by saying that it is far better to refuse business when the customer refuses to install motors in accordance with the best engineering practice, as a customer invariably fails to renew his con-

tract when he finds his bills running a great deal higher than he expected. In addition, he publishes his high costs and stops many prospective customers by his talk of robbery by the Edison Company.

It is safe to say generally that we can handle economically any business when the average load does not exceed 35 per cent. of the connected load. In one large plant an installation of 2,800 connected horse power in individual motors is driven by a 500-kw. generator, the average power required being but 15 per cent. of the connected load.

I believe we are just entering the power field, and that in a very few years the furnishing of power from central station service will be quite as important as the distribution of light. The recent developments in steam turbines and high class generators, promise to open up a vast field for power and light stations. There is no reason why central station power cannot be sold cheaper than it can be made by any isolated plant, and our experience is grounding us more firmly in this belief every day, as we only recently took out the largest isolated plant in the city of Chicago, which approximated 8,000-horse power, and connected the business to our system, saving them money, and giving them better service than they ever had from their own plant.

Altogether, we have removed over 50 isolated plants in Chicago during the past 3 years, and connected them to our system.

The removal of the isolated power plant is a natural evolution, and the supply of power from central stations is merely another example of the consolidation of all interests both from a business and an engineering standpoint.

The solution of the smoke problem, and freedom from labor troubles, are in the furnishing of power from central station service.

Calcium Cyanamide: The New Nitrogenous Fertilizer, and Source of Cyanides.

The *Journal of Gas Lighting* notes that at the International Congress of Applied Chemistry held at Berlin in June last, a paper was read by Dr. Erlwein (of the firm of Siemens & Halske), on calcium cyanamide as a new starting material for the production of cyanides of the alkalies.

The nitrogen in the cyanides is by this means derived from the nitrogen of the air; the calcium cyanamide is produced technically from carbide or carbide forming mixtures. The inception of the present cyanide method is due to the work of Dr. Frank and Dr. Caro, which showed that when nitrogen acted on the heated, powdered carbides of the metals of the alkaline earths—especially barium—carbon was deposited, and cyanamides were formed. The latter, on fusion with soda or other flux, could be converted into cyanides of the alkalies.

Pfleger made an advance when he succeeded in replacing barium carbide by calcium carbide, the manufacture of which is considerably simpler. With calcium carbide it appeared that the absorption of nitrogen, with deposition of carbon, according to the equation $CaC_2 + N_2 = CaCN_2 + C$, results only in the cyanamide being produced. In accordance with the numerous chemical and physical differences between the barium and calcium cyanamides, it was found that for the fusion for the production of cyanide, it was not necessary to use soda with the calcium as with the barium salt, but that common salt (sodium chloride) could be used instead. The product thus obtained by fusion is dissolved and treated with mineral acid. The hydrocyanic acid evolved is collected in receivers containtng alkali as an absorption agent, and on evaporation the alkaline cyanide is obtained as a commercial product.

It is an interesting and important fact that in agriculture calcium cyanamide has also proved very effective as a fertilizer for plants, because it gives up its nitrogen to the soil in a form in which it is easily assimilated. This use of the salt has been dealt with more fully by Dr. Frank in a paper of which an abstract is given in the next article. The difficulty of producing calcium cyanamide by means of a new direct process in the electrical resistance furnace, from mixtures of lime and coal, according to the equation: $CaO + 2C + 2N = CaCN_2 + CO$, has been also successfully overcome; and this renders its production cheaper than when it is made from carbide.

It was also found that the amide of the cyanamide compounds, whether obtained by nitrifaction of ordinary carbide or from lime and coal by the direct process in the resistance furnace, could be isolated in the form of crystalline dicyanodiamide by a tecnically simple leaching process. The solid white dicyanodiamide—in appearance resembling sal ammoniac—has been useful as a starting material for a new technical potassium cyanide process, which, by simple methods of fusion, yields white 100 per cent. commercial potassium or sodium cyanide.

In this fusion process, a considerable proportion of the nitrogen is converted into cyanide, while there are also formed volatile ammonia, and, as sublimation products, a mixture of cyanamides among which is melamine (tricyanotriamide), which is returned for refusion, and is thus partly converted into cyanide.

The reactions, which occur in the dicyanodiamide process, starting with the black cyanide mass coming from the furnace, may be approximately represented by the following equations:

(*a*) In the leaching:

$$2CaCN_2 + 4H_2O = 2Ca(OH)_2 + (CN.NH_2)_2$$

(*b*) In the fusion, by which several reactions take place successively, for example:

$$(CN.NH_2)_2 + Na_2CO_3 + 2C = 2NaCN + NH_3 + H + 3CO + N$$

The potassium cyanide or sodium cyanide arising in the fusion process, is, as already mentioned, a perfectly pure, white, crystalline product, which, without requiring any further purification, is equal in value to the best trade brands.

In the course of the experimental work on the conversion of calcium cyanamide nitrogen into cyanide nitrogen by fusion with common salt, a product was obtained with a value of 30 per cent. of potassium cyanide; and this has proved to be very useful for cyanide gold washing. It should—especially when manufactured in the gold mining countries themselves—be, on account of its cheapness, capable of very extended application.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At the annual meeting of the Amherst (Mass.) Gas Company the officers elected were: Directors, C. F. Deuel, Henry Adams, Fred. Tuckerman, M. A. Dickinson, George Cutler, Jr., L. M. Hills and E. D. Marsh; President, E. D. Marsh; Treasurer, C. F. Deuel; Auditor, F. C. Sherwin.

Mr. Chas. S. Gravatt, who has been connected with the General Gas Light Company, of Kalamazoo, Mich., as travelling salesman for the past year, has accepted a position with the Detroit Stove Works, representing that concern in New Jersey, Delaware and Eastern New York. He assumed the duties of his new position last Thursday.

The Riter-Conley Company, of Pittsburg, Pa., will build the new coal gas generating house for the New Haven (Conn.) Gas Light Company. It is to be on the horizontal order, with charging and drawing machinery.

The Salem (Mass.) Common Council has declined to petition the Board of Gas and Electric Light Commissioners for an order to make a reduction in the rates charged for electric lighting by the local company.

The Hamburg (Pa.) Gas Company was organized the last week in September by Messrs. H. F. Printzenhof, E. R. Schallenberger, W. O. Heinly and John R. Wagner. On the 16th inst. they will apply to the Governor of the State for a charter.

The Newark (O.) Natural Gas and Fuel Company has notified its customers that, commencing the 1st inst., no gas will be supplied unless through meter. All the Company's "flat rate" contracts have expired.

At a recent meeting of the Directors of the Oklahoma City (Okla.) Gas and Electric Company Mr. A. H. Branch tendered his resignation, which was accepted. Mr. W. E. Robertson, of Colorado Springs, Col., was elected to succeed Mr. Branch.

At a meeting of the shareholders in the Wallingford (Conn.) Gas Light Company the amendments to the Company's charter (mention of these was duly made in the Journal), as passed at the last session of the Legislature, were accepted. The contracts for plant extension were ratified.

The betterments on the plant of the Boone (Ia.) Gas Company will be completed by November 15th. The owners of the Company have so far kept all their promises.

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tract when he finds his bills running a great deal higher than he expected. In addition, he publishes his high costs and stops many prospective customers by his talk of robbery by the Edison Company.

It is safe to say generally that we can handle economically any business when the average load does not exceed 35 per cent. of the connected load. In one large plant an installation of 2,800 connected horse power in individual motors is driven by a 500-kw. generator, the average power required being but 15 per cent. of the connected load.

I believe we are just entering the power field, and that in a very few years the furnishing of power from central station service will be quite as important as the distribution of light. The recent developments in steam turbines and high class generators, promise to open up a vast field for power and light stations. There is no reason why central station power cannot be sold cheaper than it can be made by any isolated plant, and our experience is grounding us more firmly in this belief every day, as we only recently took out the largest isolated plant in the city of Chicago, which approximated 8,000-horse power, and connected the business to our system, saving them money, and giving them better service than they ever had from their own plant.

Altogether, we have removed over 50 isolated plants in Chicago during the past 3 years, and connected them to our system.

The removal of the isolated power plant is a natural evolution, and the supply of power from central stations is merely another example of the consolidation of all interests both from a business and an engineering standpoint.

The solution of the smoke problem, and freedom from labor troubles, are in the furnishing of power from central station service.

Calcium Cyanamide: The New Nitrogenous Fertilizer, and Source of Cyanides.

The *Journal of Gas Lighting* notes that at the International Congress of Applied Chemistry held at Berlin in June last, a paper was read by Dr. Erlwein (of the firm of Siemens & Halske), on calcium cyanamide as a new starting material for the production of cyanides of the alkalies.

The nitrogen in the cyanides is by this means derived from the nitrogen of the air; the calcium cyanamide is produced technically from carbide or carbide forming mixtures. The inception of the present cyanide method is due to the work of Dr. Frank and Dr. Caro, which showed that when nitrogen acted on the heated, powdered carbides of the metals of the alkaline earths—especially barium—carbon was deposited, and cyanamides were formed. The latter, on fusion with soda or other flux, could be converted into cyanides of the alkalies.

Pfleger made an advance when he succeeded in replacing barium carbide by calcium carbide, the manufacture of which is considerably simpler. With calcium carbide it appeared that the absorption of nitrogen, with deposition of carbon, according to the equation $CaC_2 + N_2 = CaCN_2 + C$, results only in the cyanamide being produced. In accordance with the numerous chemical and physical differences between the barium and calcium cyanamides, it was found that for the fusion for the production of cyanide, it was not necessary to use soda with the calcium as with the barium salt, but that common salt (sodium chloride) could be used instead. The product thus obtained by fusion is dissolved and treated with mineral acid. The hydrocyanic acid evolved is collected in receivers containtng alkali as an absorption agent, and on evaporation the alkaline cyanide is obtained as a commercial product.

It is an interesting and important fact that in agriculture calcium cyanamide has also proved very effective as a fertilizer for plants, because it gives up its nitrogen to the soil in a form in which it is easily assimilated. This use of the salt has been dealt with more fully by Dr. Frank in a paper of which an abstract is given in the next article. The difficulty of producing calcium cyanamide by means of a new direct process in the electrical resistance furnace, from mixtures of lime and coal, according to the equation: $CaO + 2C + 2N = CaCN_2 + CO$, has been also successfully overcome; and this renders its production cheaper than when it is made from carbide.

It was also found that the amide of the cyanamide compounds, whether obtained by nitrifaction of ordinary carbide or from lime and coal by the direct process in the resistance furnace, could be isolated in the form of crystalline dicyanodiamide by a tecnically simple leaching process. The solid white dicyanodiamide—in appearance resembling sal ammoniac—has been useful as a starting material for a new technical potassium cyanide process, which, by simple methods of fusion, yields white 100 per cent. commercial potassium or sodium cyanide.

In this fusion process, a considerable proportion of the nitrogen is converted into cyanide, while there are also formed volatile ammonia, and, as sublimation products, a mixture of cyanamides among which is melamine (tricyanotriamide), which is returned for refusion, and is thus partly converted into cyanide.

The reactions, which occur in the dicyanodiamide process, starting with the black cyanide mass coming from the furnace, may be approximately represented by the following equations:

(*a*) In the leaching:

$$2CaCN_2 + 4H_2O = 2Ca(OH)_2 + (CN.NH_2)_2$$

(*b*) In the fusion, by which several reactions take place successively, for example:

$$(CN.NH_2)_2 + Na_2CO_3 + 2C = 2NaCN + NH_3 + H + 3CO + N$$

The potassium cyanide or sodium cyanide arising in the fusion process, is, as already mentioned, a perfectly pure, white, crystalline product, which, without requiring any further purification, is equal in value to the best trade brands.

In the course of the experimental work on the conversion of calcium cyanamide nitrogen into cyanide nitrogen by fusion with common salt, a product was obtained with a value of 30 per cent. of potassium cyanide; and this has proved to be very useful for cyanide gold washing. It should—especially when manufactured in the gold mining countries themselves—be, on account of its cheapness, capable of very extended application.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At the annual meeting of the Amherst (Mass.) Gas Company the officers elected were: Directors, C. F. Deuel, Henry Adams, Fred. Tuckerman, M. A. Dickinson, George Cutler, Jr., L. M. Hills and E. D. Marsh; President, E. D. Marsh; Treasurer, C. F. Deuel; Auditor, F. C. Sherwin.

Mr. Chas. S. Gravatt, who has been connected with the General Gas Light Company, of Kalamazoo, Mich., as travelling salesman for the past year, has accepted a position with the Detroit Stove Works, representing that concern in New Jersey, Delaware and Eastern New York. He assumed the duties of his new position last Thursday.

The Riter-Conley Company, of Pittsburg, Pa., will build the new coal gas generating house for the New Haven (Conn.) Gas Light Company. It is to be on the horizontal order, with charging and drawing machinery.

The Salem (Mass.) Common Council has declined to petition the Board of Gas and Electric Light Commissioners for an order to make a reduction in the rates charged for electric lighting by the local company.

The Hamburg (Pa.) Gas Company was organized the last week in September by Messrs. H. F. Printzenhof, E. R. Schallenberger, W. O. Heinly and John R. Wagner. On the 16th inst. they will apply to the Governor of the State for a charter.

The Newark (O.) Natural Gas and Fuel Company has notified its customers that, commencing the 1st inst., no gas will be supplied unless through meter. All the Company's "flat rate" contracts have expired.

At a recent meeting of the Directors of the Oklahoma City (Okla.) Gas and Electric Company Mr. A. H. Branch tendered his resignation, which was accepted. Mr. W. E. Robertson, of Colorado Springs, Col., was elected to succeed Mr. Branch.

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The Market for Gas Securities.

The share market experienced another week of skyrocketing, the flashings of which even astonished the bears, who had full charge of the situation up to yesterday morning (Thursday), when the shorts, aided by purchasers for the "stocking account," came in for their try. The net result for the week of the battling is a seeming rout for the sellers, in that net prices are quite on the high side compared with those of this day week—Friday. Consolidated closed at 172 to 173, which represents a gain of 4½ points for the 7 days, and good buying indicates that, so far as Consolidated is concerned, the worst has been chronicled. We strongly advise its purchase.

Brooklyn Union is at the ridiculously low price of 180, which is the medium between the bids of buyers and sellers to-day. If Brooklyn Union is not worth 250 it is not worth anything. The rest of the gas share propositions are up from 2 to 5 points. Peoples, of Chicago, is 92¼, bid, whereas it should be 112, and there it will be before mid-December. Washington (D. C.) is quoted at 292½ to 300. It is easily worth 50 points over the asking figure. The Bay State pot is boiling furiously, with the majority of the "stuck" evidently preferring the outcome of that which will be brought about by the receiver.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 Wall Street, New York City.

October 5.

☞All communications will receive particular attention.

☞The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	172	173
Central Union, Bonds, 5's.	3,000,000	1,000	105	108
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	658,000	..	108	112
Mutual	3,500,000	100	280	295
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co..				
Bonds, 5's	11,000,000	1,000	104	106
Northern Union, Bonds, 5's.	1,250,000	1,000	105	106¼
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	102	106
" 1st Con. 5's	1,500,000	..	109	111
Standard	5,000,000	100	135	140
Preferred	5,000,000	100	155	170
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	176	183
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	⅛	¼
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works...	450,000	100	28	30
" 1st Mtg. 5's	500,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	4	5
" " Bonds, 5's	5,256,000	1,000	73	76
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central, San Francisco	1,900,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co..	20,500,000	100	93	93½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89½
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	100	102
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	64½	65
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	85	87
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	87	95
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	382,000	1,000	77	79
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	25	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225 000	1,000	104½	105

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Sept. 9, 1903.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Oct. 15th, 1903, to stockholders of record at the close of business, Sept. 30, 1903. Checks will be mailed.

1475-5 LEWIS LILLIE, Treasurer.

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If those interested in the subject could see the enormous output of the various manufacturers of Prepay Meters and Attachments, they might think that question already answered in the affirmative. Some gas officials have had the idea that Prepays could only be used profitably on the meters of delinquent consumers.

While, of course, it is of supreme importance to avoid making bad bills, in addition to this valuable feature the general use of Prepays will save from 30 to 50 per cent. in collection expenses. Some Gas Companies now have all their meters fitted with Prepays, others, nearly all. As these Companies equipped their meters with Prepay attachments gradually, it is positive evidence that the use of them has been of the greatest advantage, or they would not have continued to acquire them.

Many Gas Company Managers, admitting the great benefit to be derived from the use of Prepays, have been discouraged from using them because of their high cost and former imperfections; but there are now on the market several excellent attachments, and the objections of a few years ago have been overcome.

In this connection it may be of interest to learn something of the history of the Reeves Prepayment Attachment and its present qualifications.

The device is manufactured by the Reeves Mfg. Co., of New Haven, Conn., whose chief business has been the making of clock movements, spring motors and coin actuated mechanisms. The device is exploited by the Reeves Prepayment Meter Co., an incorporated company with paid up capital of $150,000.

It was suggested to the Reeves Company by a prominent gas company official that if they could devise and manufacture a really perfect prepay gas attachment, the trade for it would be enormous, as many gas companies would adopt it to the exclusion of ordinary meters.

Mr. E. A. Reeves, the General Manager of the Company, is an inventor by profession, and has scores of valuable patents on various clockwork devices. Acting upon the above suggestion, he made a study of the existing prepay attachments and of the requirements of a perfect device, and then evolved one on an entirely new principle, small and comparatively simple, and so constructed that upon connecting it with the index shaft of a meter it could not operate otherwise than in exact unison with the meter register. An important feature of the device is the long warning to consumers. When amount prepaid is exhausted, the gas dims appreciably, then drops to a small flame that does not go out for 10 or more hours (this being adjustable), the amount of gas so used being immaterial, as it is automatically deducted from the next prepay. The coin capacity of the device is large; more than $10 can be prepaid at one time, the amount due consumer being shown on attachment index.

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From the start the Reeves device has been a wonderful success, less than four in a thousand having been returned for any defects, and with the new features recently added, including improved method of fitting valve and deeper cut worm gear, the percentage will be even less, making it practically a perfect attachment.

The Reeves Company have had to enlarge their plant twice in a year, and even then have had to run a night force, and their business is now increasing still more rapidly. Gas companies not yet using the Reeves Attachment would do well to investigate its merits.

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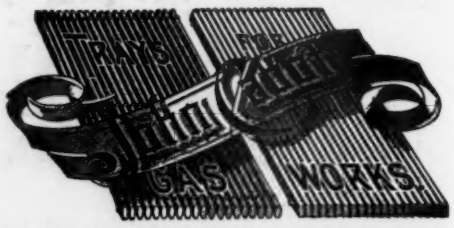

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REFERENCES.—The Peoples Gas Light and Coke Co., Chicago. . . The Jacksonville Gas Co., Jacksonville, Ills. . . Canton Gas Co., Canton, Ills. . . Galesburg Gas Co., Galesburg, Ills., etc., etc. . . The Bloomington Gas Co. writes: June 26, 1903—Alan H. Tripp, Chicago, Dear Sir: In placing our second order for your Non-Rusting Pipe Lubricant, we wish to say that the sample pail you sent us proved to be satisfactory in every way, which accounts for this second order. Yours truly, Union Gas and Electric Co., J. A. Wilcox, President, Bloomington, Ills.

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any time.

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SOLE AGENTS,
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COAL HANDLING MACHINERY.

ESTABLISHED 1872.

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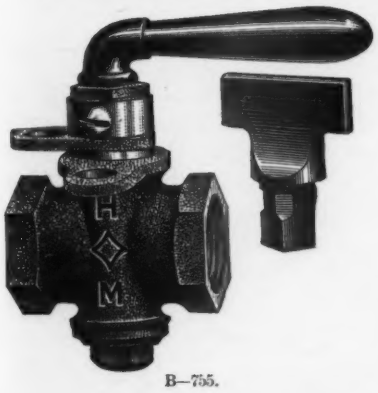

B—755.

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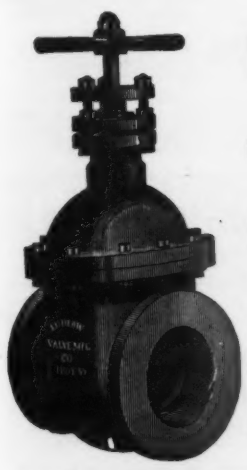

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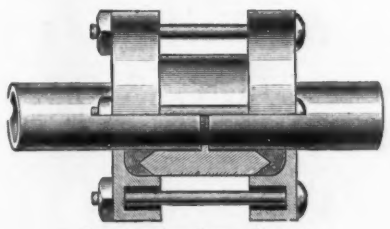
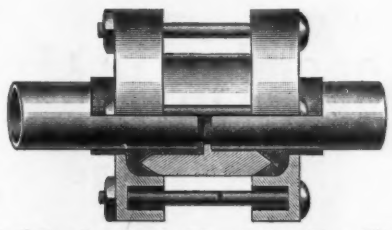
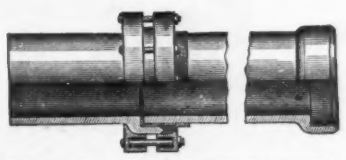
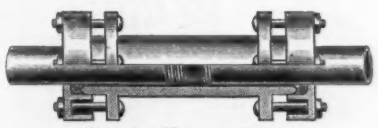
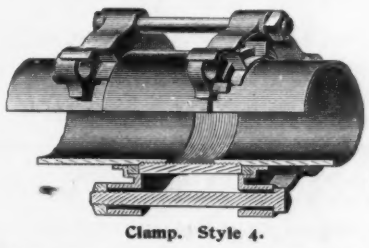

Regular Coupling. Style 1.


Insulating Coupling for Wrought Iron Pipe. Style 5.


Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.


Regular Sleeve. Style 2.


Clamp. Style 4.

Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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LOWE DOUBLE SUPERHEATER WATER GAS APPARATUS.

Coal Gas Condensing and Scrubbing Apparatus.
Purifiers with Plain or Reversing Center Valves.
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PLAIN OR REVERSING (PATENT APPLIED FOR).
Oxide, Coal and Coke Elevators and Machinery.
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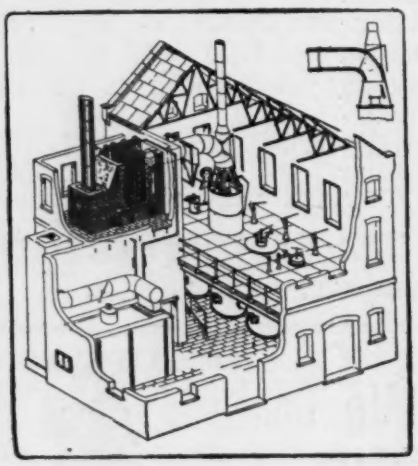
Economize Heat in Water Gas Plants,

BY UTILIZING A

Green's Economizer,



To absorb the heat now going to waste when you blow through your superheater to heat the feed water for your boilers to the temperature of the steam. This is now being done at the Poughkeepsie Gas Works, Poughkeepsie, N. Y. : : : : :

Write for full particulars how this is accomplished, the saving effected, and the advantages gained, to the

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Plans prepared and Estimates furnished at short notice.

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Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

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PRESSURE GAUGE.

For continuous records of **Street Gas Pressure**

Simple in construction, accurate in operation and low in price.

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Gas Analyses of All Sorts and Conditions,

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Analyses of Solid and Liquid Materials as Well,

That are needed by Gas Companies at any time in the conduct of their business, may be obtained from

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Gas Engineer's Pocket-book, — BY — HENRY O'CONNOR.

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Guaranteed
Results.

Also Complete
COAL and COKE
HANDLING
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Gas Exhausters,
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CONTRACTORS FOR EVERY KIND OF GAS WORKS PLANT.

"Close Specials" "Glamorgan" Pipe Fittings
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GAS TAPPING MACHINES
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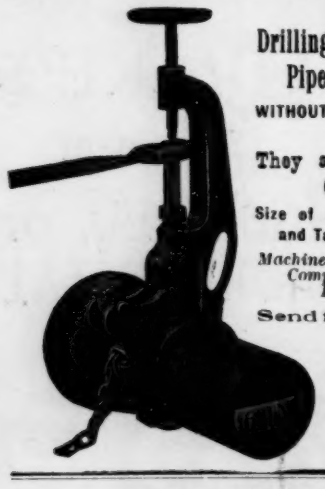
Drilling and Tapping Pipe under Pressure
WITHOUT ANY ESCAPE OF GAS.
They are Strong and Compact.
Size of Combination Drills and Taps ¾ to 4-inch.
Machines Sent to any Gas Company for Thirty Days' Trial.
Send for Circulars.

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THE
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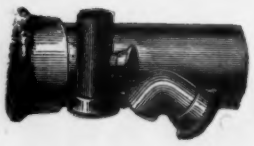
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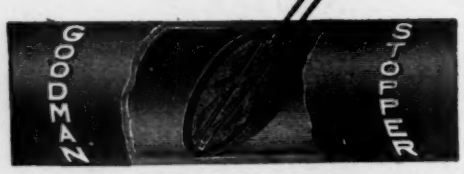
For Shutting Off Gas in Mains
Temporarily during alterations and repairs. : : : :
Any size gas main can be shut off in 30 seconds. : : :


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Address: SAFETY GAS MAIN STOPPER CO., 108 E. 117th St., New York City.

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Humphrey Crescent Instantaneous Water Heater
IS A QUICK SELLER.

PRICE,
$20.00.
SHELF AND BRACKET FREE.
HAS NO EQUAL AT THE PRICE.
TRY ONE AND BE CONVINCED. WILL SEND ON 60 DAYS' APPROVAL.
HAVE YOU OUR CATALOGUE?
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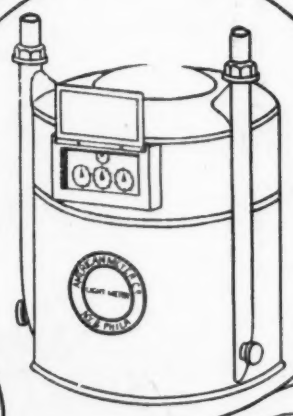
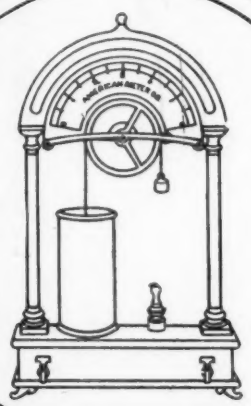
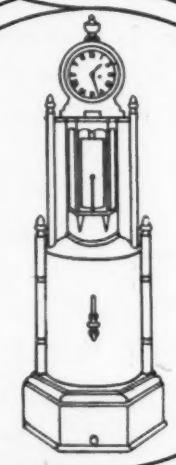
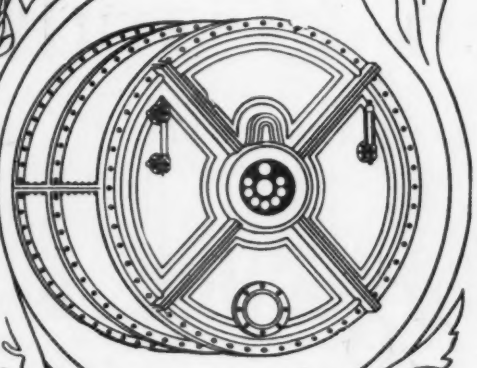








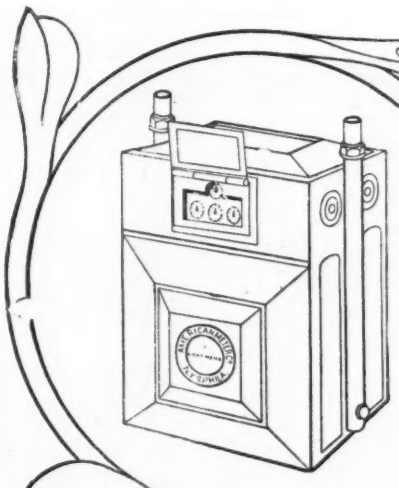
PUBLIC LIGHTING TABLE.

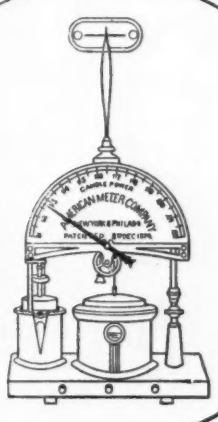
OCTOBER, 1903.

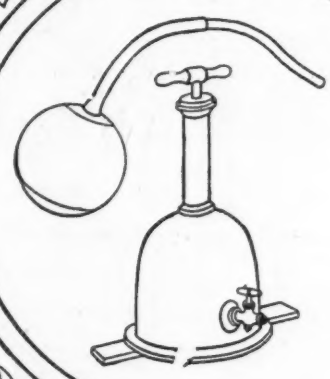
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	1.00 AM	4.50 AM	5.30	5.00
Fri.	2	2.00	4.50	5.30	5.00
Sat.	3	2.50	4.50	5.30	5.00
Sun.	4	3.50	5.00	5.30	5.00
Mon.	5	No L.	No L.	5.30	5.00
Tue.	6	No L. FM	No L.	5.30	5.00
Wed.	7	No L.	No L.	5.30	5.00
Thu.	8	6.00 PM	8.00 PM	5.20	5.10
Fri.	9	6.00	8.40	5.20	5.10
Sat.	10	6.00	9.20	5.20	5.10
Sun.	11	5.50	10.20	5.20	5.10
Mon.	12	5.50	11.10	5.20	5.10
Tue.	13	5.50 LQ	12.20 AM	5.20	5.10
Wed.	14	5.50	1.20	5.20	5.10
Thu.	15	5.50	2.30	5.10	5.20
Fri.	16	5.50	3.40	5.10	5.20
Sat.	17	5.50	5.10	5.10	5.20
Sun.	18	5.40	5.20	5.10	5.20
Mon.	19	5.40	5.20	5.10	5.20
Tue.	20	5.40 NM	5.20	5.10	5.20
Wed.	21	5.40	5.20	5.10	5.20
Thu.	22	5.40	5.20	5.00	5.30
Fri.	23	5.40	5.20	5.00	5.30
Sat.	24	5.40	5.20	5.00	5.30
Sun.	25	8.10	5.20	5.00	5.30
Mon.	26	9 00	5.20	5.00	5.30
Tue.	27	10.00 FQ	5.20	5.00	5.30
Wed.	28	10.50	5.20	5.00	5.30
Thu.	29	11.50	5.20	4.45	5.35
Fri.	30	12.40 AM	5.20	4.45	5.35
Sat.	31	1.40	5.20	4.45	5.35

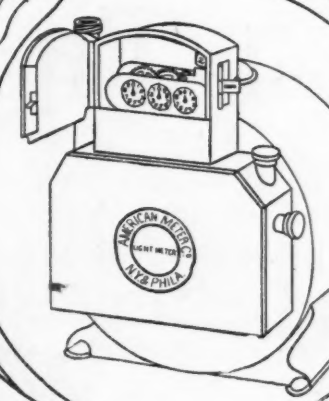
TOTAL HOURS LIGHTING DURING 1903.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	245.00	January	423.20
February	192.00	February	355.25
March	201.00	March	355.35
April	167.20	April	298.50
May	152.00	May	264.50
June	131.00	June	234.25
July	140.40	July	243.45
August	156.20	August	280.25
September	171.20	September	321.15
October	198.20	October	374.30
November	216.30	November	401.40
December	232.10	December	433.45
Total, yr.	2203.40	Total, yr.	3987.45





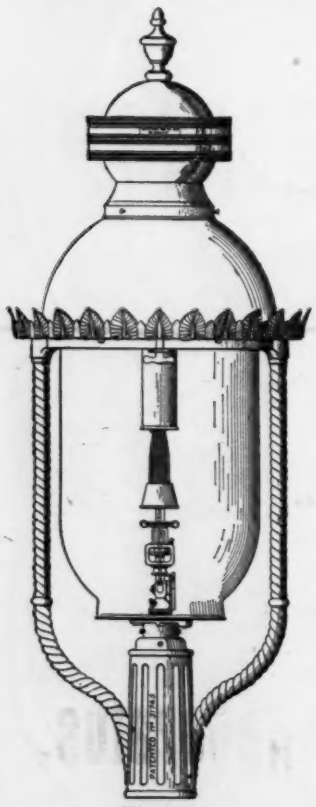




NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Controls
and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

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The formula is simple-

THIS SHIELD IS THE WELSBACH TRADE MARK.

IT IS A GUARANTEE AND A PROTECTION.

Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

And your profit isn't merely dollars and cents.

WELSBACH CO.,

Broad and Arch Sts., PHILADELPHIA.

THE UNITED GAS IMPROVEMENT COMPANY

For the Six Months Ending July 1, 1903, has been Awarded Contracts in the Following Places for

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Baltimore, Md.	Hempstead, N. Y.	Dover, Del.
Chicago, Ills.	Chester, Pa.	Allentown, Pa.
Amesbury, Mass.	Lynn, Mass.	Savannah, Ga.
Aberdeen, S. D.	Newark, N. J.	New York (Central Union Co.)
Winsted, Conn.	Washington, D. C.	Cicero, Ills.
Canon City, Col.	Boone, Ia.	Chicago (Ogden Co.)
Schenectady, N. Y.	Pueblo, Col.	Easton, Pa.
Hagerstown, Md.	Charlotte, N. C.	Lawrence, Mass.
Malden, Mass.	Fall River, Mass.	Council Bluffs, Ia.
Bridgeport, Conn.	Duluth, Minn.	Chattanooga, Tenn.
Albert Lea, Minn.	New York (Mutual Co.)	

TOTAL SETS TO JULY 1, 1903, ... 51
TOTAL DAILY CAPACITY, ... 55,150,000 cubic feet.
TOTAL SETS TO DATE, ... 498
TOTAL DAILY CAPACITY, ... 354,830,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

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CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

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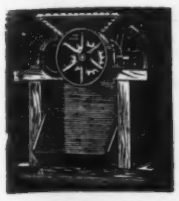

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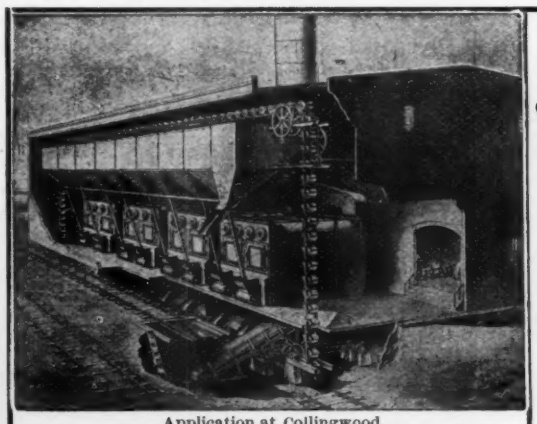

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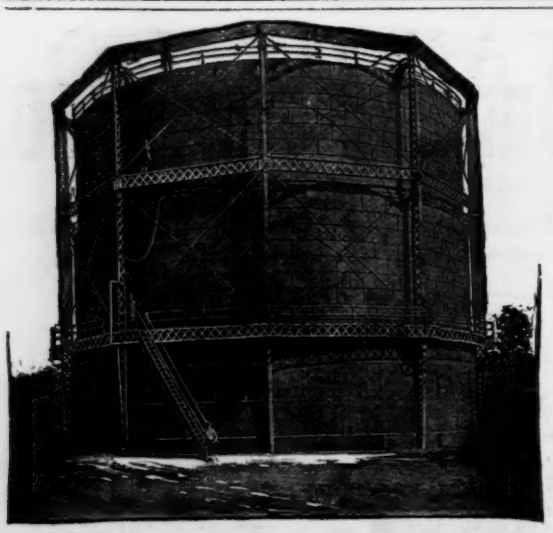

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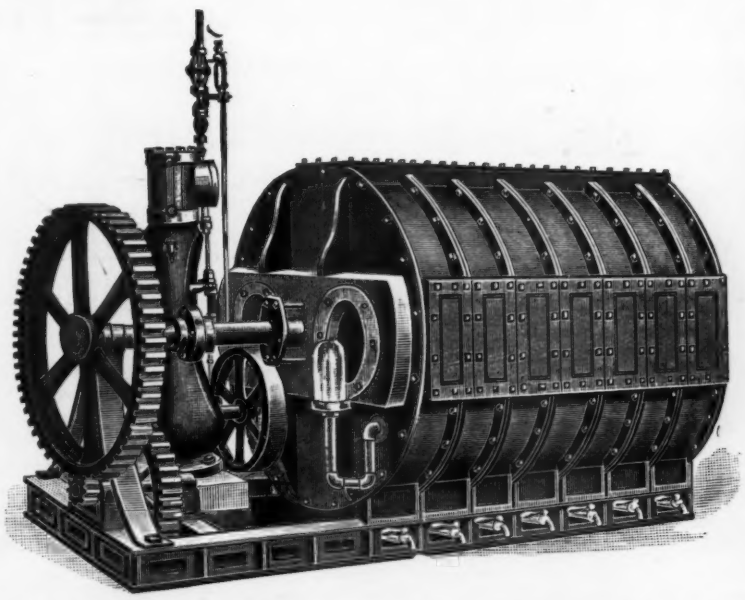

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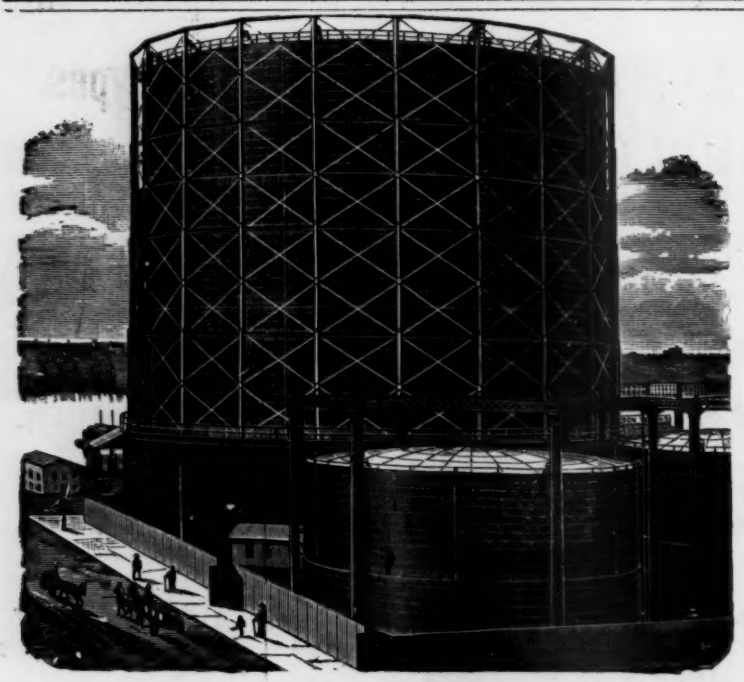

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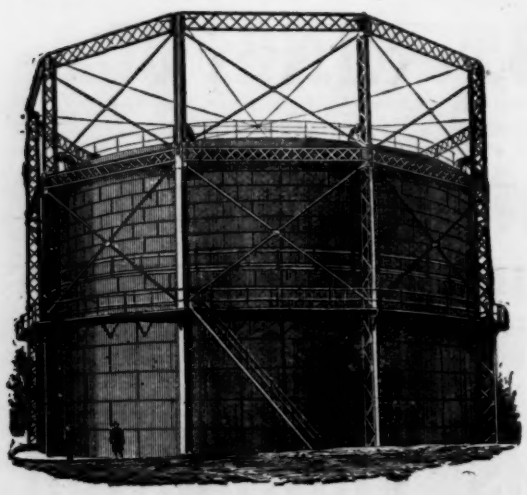

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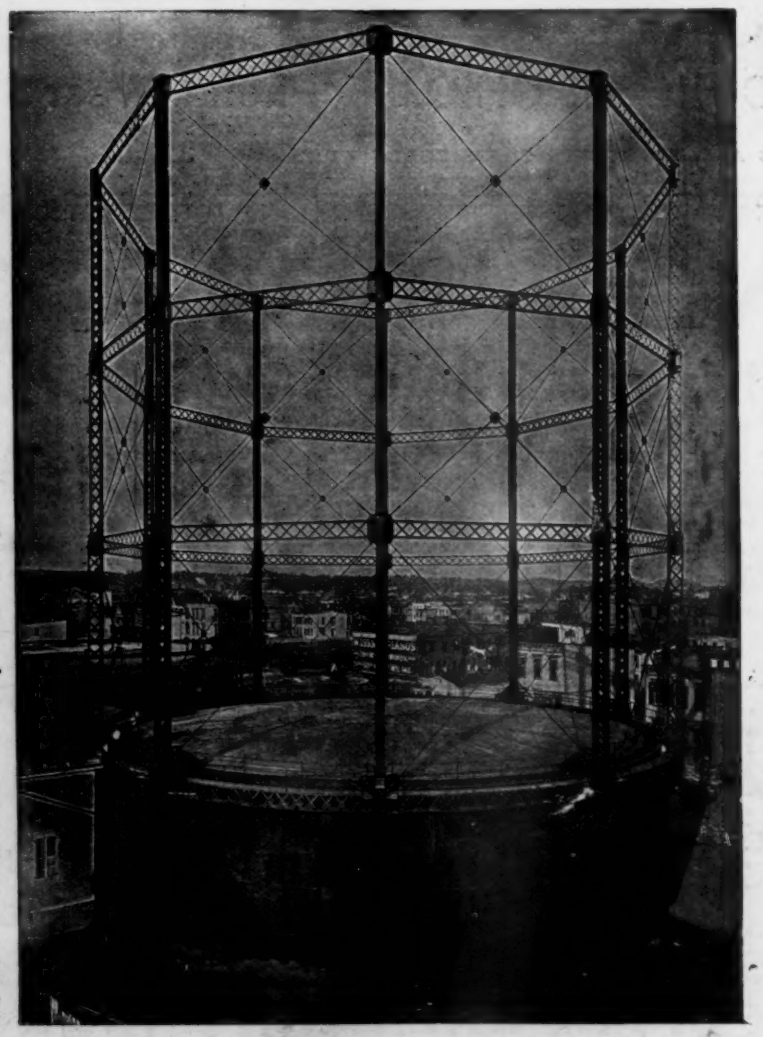

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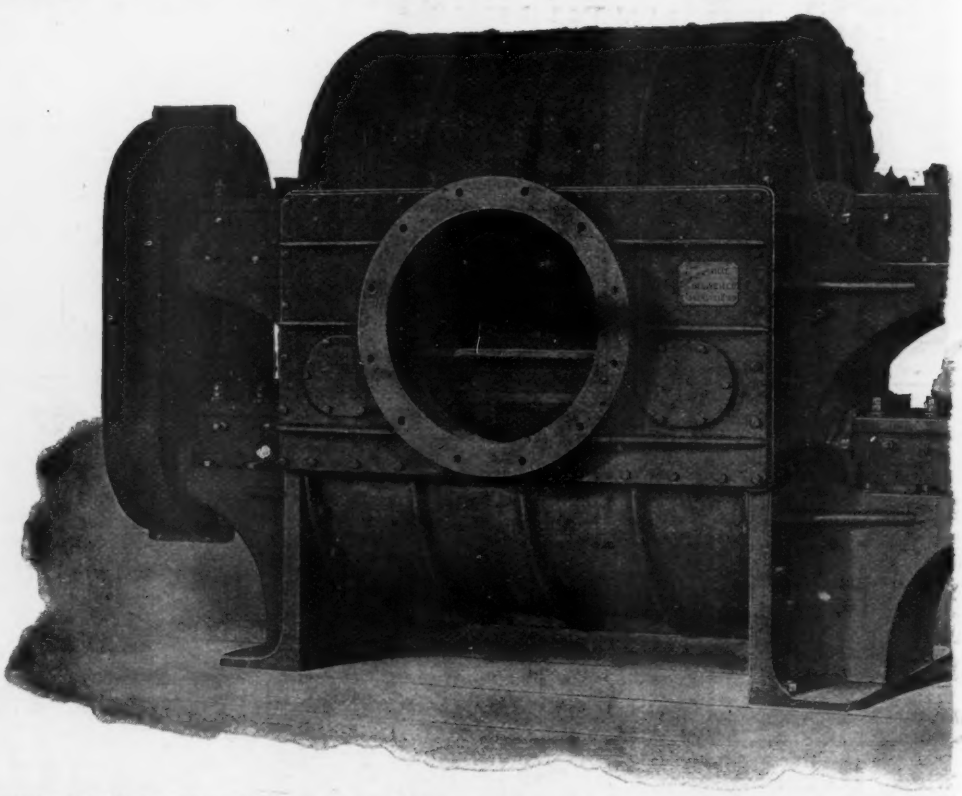

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